EXHIBIT A

US005743817A

United States Patent [19]

Yamagishi et al.

[11] Patent Number: 5,743,817

[45] Date of Patent: Apr. 28, 1998

[54] **GOLF BALL**

[75] Inventors: **Hisashi Yamagishi; Yoshinori Egashira; Hideo Watanabe**, all of Chichibu, Japan

[73] Assignee: **Bridgestone Sports Co., Ltd.**, Tokyo, Japan

[21] Appl. No.: **536,049**

[22] Filed: **Sep. 29, 1995**

[30] **Foreign Application Priority Data**

Oct. 14, 1994 [JP] Japan 6-276109
Dec. 14, 1994 [JP] Japan 6-333024

[51] **Int. Cl.**[6] **A63B 37/06**; A63B 37/12

[52] **U.S. Cl.** **473/377**; 473/351; 473/385

[58] **Field of Search** ..... 473/372, 373, 473/351, 377, 385, 370, 374, DIG. 22

[56] **References Cited**

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Primary Examiner—George J. Marlo
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas, PLLC

[57] **ABSTRACT**

A solid golf ball comprising a core and a cover is provided. The core has a core hardness expressed by a distortion of 2.2–4.0 mm under a load of 100 kg. The core hardness divided by the ball hardness ranges from 1.0 to 1.3. The cover has a thickness of 1.3–1.8 mm. The ball is improved in feel and spin while maintaining the flying distance inherent to solid golf balls.

2 Claims, 1 Drawing Sheet

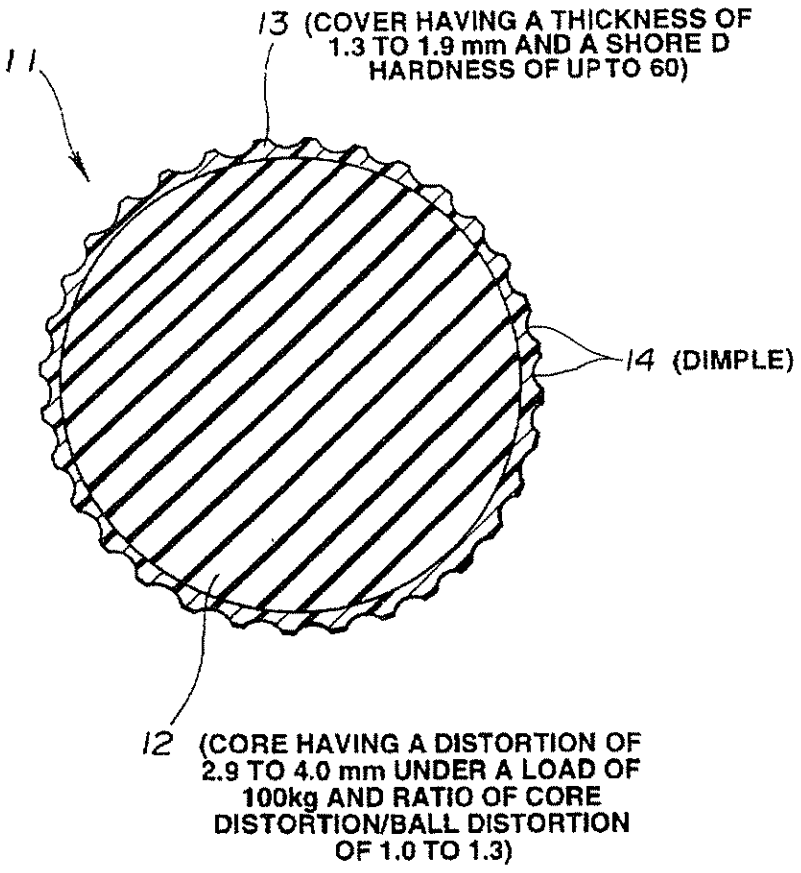
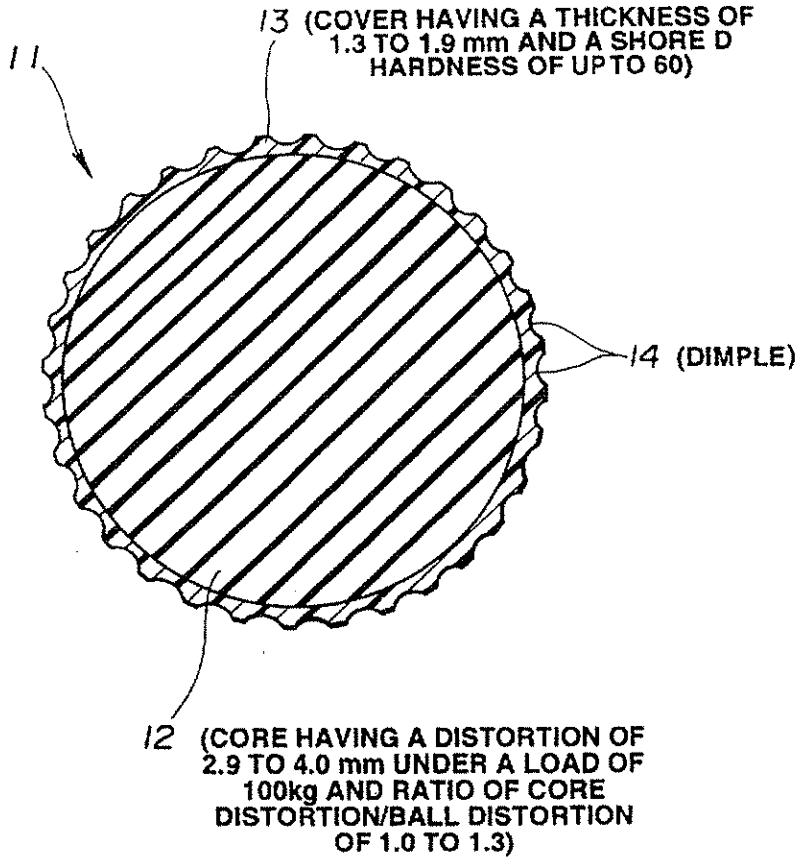


FIG.1


11
13 (COVER HAVING A THICKNESS OF 1.3 TO 1.9 mm AND A SHORE D HARDNESS OF UP TO 60)
14 (DIMPLE)
12 (CORE HAVING A DISTORTION OF 2.9 TO 4.0 mm UNDER A LOAD OF 100kg AND RATIO OF CORE DISTORTION/BALL DISTORTION OF 1.0 TO 1.3)

GOLF BALL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a solid golf ball having improved feel and spin performance.

2. Prior Art

As compared with wound golf balls, two-piece golf balls and other solid golf balls are advantageous in gaining a flying distance since they fly along the trajectory of a straight ball when hit by both drivers and irons. This advantage is mainly attributable to their structure. Because of their configuration less receptive to spin, the solid golf balls are given a straight ball trajectory and yield a more run, resulting in an increased total flying distance.

In turn, the solid golf ball tends to draw a "flier" path on an iron shot since it is less receptive to spin and does not readily stop on the green. Because of such characteristics, the two-piece balls are not preferred by experienced players.

Therefore, there is a need for a solid golf ball having improved spin properties and allowing the player to aim the pin dead with an iron. The increased flying distance inherent to the solid golf ball should be maintained and of course, the ball should have a pleasant feel.

SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide a solid golf ball such as a two-piece golf ball which is improved in feel, spin properties and iron control without detracting from the trajectory and flying distance inherent to the solid golf ball. The term iron control is the controllability of a ball on an iron shot, more specifically stop on the green.

Briefly stated, the present invention pertains to a solid, typically two-piece, golf ball comprising a core and a cover enclosing the core. The hardness of the core, cover and ball are referred to as core hardness, cover hardness, and ball hardness, respectively. According to the invention, the core hardness is such that the core undergoes a distortion of at least 2.2 mm under a load of 100 kg. The core hardness divided by the ball hardness is in the range of 1.0 to 1.3. The cover has a radial thickness of 1.3 to 1.8 mm. This parameter control leads to a golf ball satisfying the requirements of flying distance, feel and spin.

Consider the spin mechanism of golf balls made of the same materials, but changed in hardness. Provided that the club head speed and the cover material are identical, the coefficient of friction between the ball and the club face is identical and hence, an identical frictional force is exerted therebetween. Only distortion is different due to differential hardness. Then the distance between the center of gravity and the ball-club contact point is different. The harder the ball, the longer is the contact point distance. The softer the ball, the shorter is the contact point distance. Then harder balls are more receptive to spin.

The spinning mechanism associated with an iron suggests that the spin quantity can be increased by increasing the ball hardness. Increasing the ball hardness, however, gives a harder feel, exacerbating the hitting feel. The spin quantity can also be increased by making the cover softer. A softer cover, however, deprives the ball of repulsion, resulting in a loss of initial speed and flying distance.

Attempting to increase the spin quantity for improving spin properties by using a soft material, typically a material having a Shore D hardness of 60 or lower as the cover, we found that a low hardness cover lowers repulsion, resulting in a loss of flying distance on hitting. Quite unexpectedly, we have found that by adjusting the core hardness to a distortion of at least 2.2 mm under a load of 100 kg, the ratio of core hardness to ball hardness to range from 1.0 to 1.3 and the cover thickness to range from 1.3 mm to 1.8 mm, the golf ball, whose cover is made of a softer material, is improved in iron control (that is, stop on the green) without deterring the feel and flying distance and without losing the trajectory and flying distance on a driver shot inherent to solid golf balls.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic cross section illustrating one embodiment of the golf ball of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the golf ball comprising a spherical solid core enclosed in a cover according to the present invention, the core hardness is at least 2.2 mm as expressed by a distortion under a load of 100 kg, the core hardness divided by the ball hardness is in the range of 1.0 to 1.3 and the cover has a thickness of 1.3 to 1.8 mm.

The core hardness and ball hardness are defined by distortions (in mm) of the core and ball under a load of 100 kg, respectively. The core hardness corresponds to such a distortion of at least 2.2 mm, preferably at least 2.5 mm, more preferably 2.5 to 4.0 mm, most preferably 3.0 to 4.0 mm. With a core distortion of less than 2.2 mm, the feel becomes unpleasant. Too much core distortions would result in balls having poor restitution, low flying performance and a too soft feel. By controlling the core hardness/ball hardness so as to fall in the range between 1.0 and 1.3, especially between 1.0 and 1.25, the solid golf ball, typically two-piece golf ball is improved in feel, flying distance and spin characteristics. If the core hardness/ball hardness is less than 1.0, the feel becomes unpleasant. If the core hardness/ball hardness exceeds 1.3, the ball loses a quick stop on the green.

It is understood that the golf ball of the invention is advantageously applied to two-piece golf balls having a single core. It is also applicable to multi-core golf balls having a core consisting of two or more layers, such as three-piece golf balls. In an example where the core consists of two inner and outer layers, the core hardness refers to the hardness of the spherical two-layer core as a whole. Differently stated, the core hardness refers to the hardness of an entire spherical core left after removing the cover from the ball.

The cover has a Shore D hardness of up to 60, especially 55 to 60. A cover hardness of more than 60 would adversely affect spin characteristics and stop on the green. Since a cover with too low hardness would result in poor repulsion and a loss of flying distance, the lower limit of 55 is recommended for the cover hardness.

According to the invention, the cover has a radial thickness of 1.3 to 1.8 mm, especially 1.4 to 1.8 mm. Outside the range, the objects of the invention cannot be achieved. A cover of thinner than 1.3 mm is less resistant against top damage and liable to be broken. A cover of thicker than 1.8 mm leads to losses of repulsion and flying performance and gives a dull feel.

In general, the flying distance the ball covers depends on the head speed. The flying distance is reduced by a change from a higher head speed to a lower head speed. The degree

of reduction of the flying distance by a change from a higher head speed to a lower head speed can be suppressed by limiting the cover thickness to the above-defined range. Differently stated, the dependency of flying distance on head speed is alleviated. Therefore, the ball of the invention is suitable for senior and female players who swing at a relatively low head speed.

In one preferred embodiment of the invention, the golf ball has a spin factor of 1.0 to 1.5. The spin factor is defined as follows. The golf ball has a spin quantity when hit by a pitching wedge (referred to as wedge spin quantity) and a spin quantity when hit by a driver (referred to as driver spin quantity). The spin factor is obtained by dividing the ratio of the wedge spin quantity to the driver spin quantity by the ball hardness. Then a spin factor smaller than unity means that the ball has greater spin with the driver and less spin with the pitching wedge. The former indicates that the trajectory is lofted and the flying distance is reduced. The latter indicates that when hit with an iron, the ball draws a flier-like trajectory and flies too much. A greater spin factor is then desirable. Then the object of the invention to render the ball receptive to less spin with a driver and more spin with an iron is effectively accomplished. However, a too greater spin factor would exacerbate ball control on an iron shot because the ball can be moved back too much due to back spin. For this reason, the spin factor is preferably in the range between 1.0 and 1.5.

The golf ball of the invention is advantageously applied to two-piece golf balls while it is also applicable to multi-core golf balls such as three-piece golf balls. The material and preparation of the core and cover are not critical. The components may be made of any of well-known materials insofar as the requirements of the invention are met. Of course, the golf ball of the invention has a standard size and weight.

More particularly, the core of the present solid golf ball is formed from a rubber composition by a conventional method while properly adjusting the component proportion and vulcanizing conditions. The core composition generally includes a base rubber, a crosslinking agent, a co-crosslinking agent, an inert filler, and other components. The base rubber may be selected from natural and synthetic rubbers conventionally used in the manufacture of solid golf balls. Preferably the base rubber is 1,4-polybutadiene rubber containing at least 40% of cis-configuration, optionally in admixture with natural rubber, polyisoprene rubber or styrene-butadiene rubber. The crosslinking agent is preferably selected from organic peroxides such as dicumyl peroxide and di-t-butyl peroxide, with the dicumyl peroxide being more preferred. Preferably the crosslinking agent is blended in an amount of about 0.5 to 3 parts, more preferably about 0.8 to 1.5 parts by weight per 100 parts by weight of the base rubber. Non-limiting examples of the co-crosslinking agent include metal salts of unsaturated fatty acids, especially zinc and magnesium salts of unsaturated fatty acids having 3 to 8 carbon atoms, such as acrylic acid and methacrylic acid. Zinc acrylate is the most preferred salt. The co-crosslinking agent is preferably blended in an amount of about 24 to 38 parts, more preferably about 28 to 34 parts by weight per 100 parts by weight of the base rubber. Examples of the inert filler include zinc oxide, barium sulfate, silica, calcium carbonate, and zinc carbonate, with the zinc oxide being most often used. The amount of the filler blended depends on the desired specific gravity of the core and cover, ball weight, and other factors although it generally ranges from about 10 to about 60 parts by weight per 100 parts by weight of the base rubber.

These components are blended to form a core-forming rubber composition which is kneaded by means of a conventional kneading machine such as a Banbury mixer and roll mill and then compression or injection molded in a spherical mold cavity. The molded composition is cured by heating it at a sufficient temperature for the crosslinking and co-crosslinking agents to exert their function (for example, about 130° to 170° C. when the crosslinking agent is dicumyl peroxide and the co-crosslinking agent is zinc acrylate). In this way, a solid spherical core having a diameter of 37 to 40 mm is prepared.

In the case of a two layer core, the inner core may be made of the same composition as above and the outer core may be made of a similar rubber composition or a resin composition based on an ionomer resin or the like. The outer core may be formed by compression molding or injection molding it around the inner core. Typically the inner core has a diameter of 27.0 to 38.0 mm, preferably 28.0 to 36.0 mm and the outer core has a diameter of 0.5 to 6.5 mm, preferably 1.5 to 5.5 mm, and the total diameter ranges from 37 to 40 mm.

The solid core is enclosed with the cover by any desired technique, for example, by enclosing the core in a pair of semi-spherical shell halves followed by heat compression molding. Alternatively the core is directly covered with a cover material by injection molding. By properly selecting the material and amount of the core and cover and preparation conditions such as vulcanizing conditions, a golf ball satisfying the requirements of the invention can be prepared.

There has been described a golf ball which is improved in feel and spin characteristics while maintaining the flying distance inherent to solid golf balls and which undergoes a lower degree of reduction of its flying distance upon hitting at a lower head speed.

EXAMPLE

Examples of the present invention are given below by way of illustration and not by way of limitation.

Examples 1–6 and Comparative Examples 1–2

Cores having a hardness as shown in Table 1 were molded by vulcanizing in a mold rubber compositions comprising cis-1,4-polybutadiene rubber, zinc acrylate, zinc oxide, and dicumyl peroxide. The core hardness reported is a distortion in millimeter under a load of 100 kilograms.

The cores were enclosed with covers which were formed from mixtures of ionomer resins. The blending proportion of ionomer resins was changed to form covers having varying hardness (Shore D scale) as shown in Table 2. In this way, there were obtained large-size two-piece golf balls having a hardness as shown in Table 3. The ball hardness reported is again a distortion in millimeter under a load of 100 kilograms.

The base composition for the core consisted of the following components.

	Parts by weight
cis-1,4-polybutadiene rubber (BR01)	100
zinc acrylate	33.2
zinc oxide	10
barium sulfate	9.7
anti-oxidant	0.2
dicumyl peroxide	0.9

Cores having varying hardness and specific gravity were obtained by varying the amounts of zinc acrylate and barium sulfate as shown in Table 1.

TABLE 1

Core hardness	Cover gage 1.4 mm	1.6 mm	1.8 mm	2.0 mm	2.4 mm
2.48–2.50 mm	33.0	33.0	33.0	33.0	
	6.4	7.5	8.6	9.7	
2.88–2.91 mm	31.0	31.0	31.0	31.0	31.0
	7.8	8.8	9.9	11.0	13.9
3.25–3.30 mm	28.0	28.0	28.0	28.0	
	9.1	10.2	11.2	12.3	

At the upper and lower stages for each core hardness and cover gage combination, the amounts of zinc acrylate and barium sulfate are reported in parts by weight, respectively.

The base composition for the cover was a 50/50 (by weight) mixture of ionomer resins, Himilan 1650 and Surlyn 8120. Covers having varying hardness were obtained while blending Himilan 1650 and Surlyn 8120 in a ratio as shown in Table 2.

TABLE 2

Cover hardness (Shore D)	Resin mix	Weight ratio
56	H1650/S8120	40/60
57	H1650/S8120	50/50
65	H1605/H1706	50/50

* H: Himilan commercially available from du Pont-Mitsui Polychemical Co., Ltd.
S: Surlyn commercially available from E. I. duPont

The golf balls were examined for fly, stop on the green, and feel by the following procedures.

Fly Test

Using a swing robot manufactured by True Temper Co., the ball was hit by a driver at a head speed (HS) of 45 m/s and by an iron at a head speed of 35 m/s to measure the flying distance.

Stop on the Green Test

Using a swing robot manufactured by True Temper Co., the ball was hit by a pitching wedge at a head speed of 35 m/s so as to fly directly on the green. The distance between the landing and stop positions was measured. A negative value is the distance the ball covers due to back spin. A positive value is a run in a flying direction. The stop on the green was rated "O" for quick stop and "X" for non-stopping.

Feel Test

In a sensory test, a player hit the ball at a head speed (HS) of 35 m/s. The ball feel was rated "very soft", "soft" or "hard".

Note that the dependency of flying distance on head speed is expressed by the flying distance at a head speed of 35 m/s divided by the flying distance at a head speed of 45 m/s and simply reported under the heading "HS35/HS45" in Table 3.

TABLE 3

	Example 1	2	3	4	5	6	Comparative Example 1	2
Core hardness (mm)	2.48	3.30	2.50	2.90	2.91	3.25	2.10	2.85
Ball hardness (mm)	2.36	3.10	2.30	2.71	2.65	2.90	1.90	2.10
Core/ball hardness ratio	1.05	1.06	1.09	1.07	1.10	1.12	1.11	1.36
Cover thickness (mm)	1.4	1.4	1.6	1.6	1.8	1.8	1.8	2.4
Cover hardness (Shore D)	56	57	56	56	56	57	57	65
Feel @ HS35	soft	very soft	soft	very soft	soft	very soft	hard	soft
Flying distance (m)								
@ HS 35	154	160	154	158	157	159	147	148
@ HS 45	234	237	232	233	233	236	228	235
Stop on the green								
Landing-to-stop distance (m)	−0.5	0.5	0.0	0.0	0.0	0.5	0.0	2.5
Rating	o	o	o	o	o	o	o	x
HS35/HS45	0.658	0.675	0.664	0.678	0.674	0.673	0.645	0.630

Although some preferred embodiments have been described, many modifications and variations may be made thereto in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

We claim:

1. A golf ball comprising a core and a cover wherein said core and said ball has a core hardness and a ball hardness respectively, wherein said core has a distortion of 2.9 to 4.0 mm under a load of 100 kg, the ratio of a core distortion under a load of 100 kg divided by a ball distortion under a load of 100 kg ranges from 1.0 to 1.3, and said cover consists of an ionomer resin as a resin component and has a thickness of 1.3 to 1.8 mm and a Shore D hardness of up to 60.

2. The golf ball of claim 1 wherein said cover has a thickness of 1.6 to 1.8 mm.

* * * * *

EXHIBIT B

THIS EXHIBIT HAS BEEN REDACTED IN ITS ENTIRETY

EXHIBIT C

UNITED STATES DISTRICT COURT
DISTRICT OF DELAWARE

BRIDGESTONE SPORTS CO., LTD., and BRIDGESTONE GOLF, INC., Plaintiffs, v. ACUSHNET COMPANY, Defendant.	Case No. 05-CA-132 (JJF) **INVALIDITY EXPERT REPORT OF DR. DAVID FELKER**
ACUSHNET COMPANY, Counterclaimant, v. BRIDGESTONE SPORTS CO., LTD., and BRIDGESTONE GOLF, INC., Counterdefendant.	

b. The level of ordinary skill in the art;

c. The differences between the claimed invention and the prior art;

d. Whether the differences are such that the claimed invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made; and

e. Whether secondary considerations exist, such as long-felt but unresolved need, failure of others, commercial success, licensing, copying, etc., and, if so, whether there is a nexus between the secondary consideration and the claimed invention.

I have considered the above criteria in performing my analysis and forming my opinions found in this report. I understand that under U.S. patent laws, issued patents are presumed valid, but that presumption can be rebutted. I further understand that the presumption of validity is more easily overcome where the evidence consists of material prior art not cited by the patentee and not considered by the Examiner during prosecution. I also understand that when reviewing the validity of a claim, the analysis is to be performed from the perspective of one of ordinary skill in the art. In my opinion, one of ordinary skill in the art at the relevant time period for each of the Bridgestone patents I address would have had a B.S. in chemistry or an equivalent discipline with five or more years of experience in the golf ball manufacturing field.

I understand that a U.S. patent application may claim the benefit of an earlier filing date of a foreign application(s). To obtain this benefit, certain rules must be followed, one of which, as I understand it, is that the foreign patent application must contain a written description of the invention, and of the manner and process of making and using the invention, in such full, clear, concise, and exact terms as to enable any person skilled in art to which it pertains to make and to use the full scope of the invention as claimed.

V. THE '852 PATENT

A. Disclosure of the '852 Patent

The '852 patent relates to three-piece golf balls comprising a core, and intermediate layer and an outer cover. The center core of the golf ball claimed in the'852 patent has a diameter of at least 29 mm and a specific gravity of less than 1.4. The intermediate layer of the '852 ball has

> A golf ball comprising a core and a cover wherein said core and said ball has a core hardness and a ball hardness respectively, wherein said core has a distortion of 2.9 to 4.0 mm under a load of 100 kg, the ratio of a core distortion under a load of 100 kg divided by a ball distortion under a load of 100 kg ranges from 1.0 to 1.3, and said cover consists of an ionomer resin as a resin component and has a thickness of 1.3 to 1.8 mm and a Shore D hardness of up to 60.

(Ex. 16, '817 patent at col. 6, lines 48-56).

B. The Japanese Priority Documents

Bridgestone filed the United States application on September 29, 1995, claiming priority to two Japanese applications – one filed on October 14, 1994 and the second filed on December 14, 1994.

In the October 1994 Japanese application, the inventors initially claimed (1) a core distortion of at least 2.2 mm under a 100 kg load, (2) a range of core distortion divided by ball distortion of 1.0-1.3, and (3) a cover thickness of 1.3-2.4 mm. (See Ex. 18, BSP 242814-242830). As early as March 14, 1994, however, Bridgestone manufactured and sold the Precept EV Extra Spin golf ball in the United States. (*See* Ex. 19, AB 4601-4602). The Precept EV Extra Spin met every limitation of the October 1994 application – it (1) had a core distortion of 2.9, (2) a ball distortion of 2.79, providing a ratio of core distortion divided by ball distortion of 1.1, and (3) a cover thickness of 2.0 mm. (*See* Ex. 20, BSP 89622-26; Ex. 21, Watanabe 8/25/06 Dep. at 166:16-175:22). Thus, the Precept EV Extra Spin golf ball would have anticipated claim 1 of the '817 patent as it was originally drafted in the October 1994 Japanese application.

In the revised Japanese application filed in December 1994, the inventors reduced their claimed cover thickness range to 1.3-1.8 mm. (Ex. 22, Appl. No. 6-333024 at 1). As that was the only change between the two applications, the inventors conceivably reduced the claimed cover thickness in order to preclude anticipation by the prior art Precept EV Extra Spin golf ball. When filed in the United States, the '817 patent application claimed the narrower range of cover thickness from the December 1994 application.

C. The Prosecution History

The application that matured into the '817 patent was filed in the United States Patent and Trademark Office on September 29, 1995. The patent examiner initially rejected all three claims as anticipated and/or obvious over a number of references, including Bridgestone's own British patent application GB 2 276 628 ("GB '628"). (Ex. 23, Sep. 3, 1996 Office Action at 3-4). In doing so, the examiner stated

> As understood, only inherent features of the reference golf balls are claimed. Any possible distinctions over said golf balls are deemed obvious arbitrary variants thereof, simply to provide comparative examples.

(*Id.* at 3). The examiner specifically addressed the claimed ratio of core distortion by ball distortion (initially claimed as core ***hardness*** divided by ball ***hardness*** – in the context of the core and ball measurements of the '817 patent, "hardness" and "distortion" are synonymous terms that refer to the deformation of the core and/or ball under a 100 kg load). The examiner stated that "since no prior art publication has heretofore disclosed a hardness ratio of the core hardness divided by ball hardness, the invention cannot be properly searched." (*Id.* at 2).

In response to the examiner's rejection, Bridgestone amended its application. Among other things, it changed the core distortion requirement from "at least 2.2 mm" to "a distortion of 2.9 to 4.0 mm," added the requirements that the cover (1) "consist of an ionomer resin as a resin component" and have (2) "a Shore D hardness of up to 60." (Ex. 23, March 4, 1997 Amendment at 1).

In addition, Bridgestone distinguished the '817 patent application from GB '628. In its argument to the patent examiner, Bridgestone stated that the British reference

> fails to disclose the combination of the cover thickness and the core distortion of the present golf ball. The cover thickness of [GB '628] is 2.0 mm and the core distortion is 2.51 to 2.71 (see Examples) which do not fall within the presently claimed range.
>
> Furthermore, as the core distortion increases the core becomes softer. The present core distortion of 2.9 to 4.0 mm under a load of 100 kg means that the core is very soft. Also, the present cover hardness is up to 60 on Shore D and thus is not hard. In general, the combination of a softer core and a softer cover results in low repulsion, i.e., an inferior flying distance. In the present golf ball, since the cover

> thickness is 1.3 to 1.8 mm which is thin and the ratio of core distortion/ball distortion is 1.0 to 1.3, a flying distance as well, as stop on the green, are good regardless of the combination of a soft core and cover. This feature of the present invention is not disclosed or taught by [GB '628], as well as the other references.

(*Id.* at 7).

On April 24, 1997, the examiner allowed the three claims of the '817 patent. (Ex. 23, Apr. 24, 1997 Office Action at 1).

D. The '817 Patent Is Very Narrow

Because the '817 patent is markedly similar to the prior art Bridgestone Precept EV Extra Spin golf ball, its scope was very narrow from its inception. As noted above, the manufacturing specifications for the Precept EV Extra Spin golf ball show that it embodied every property of the originally-filed Japanese application. Even as filed in the United States, the '817 patent differs only slightly from that golf ball as shown from Bridgestone's own manufacturing specifications for the ball:

- Claim 1 of the '817 patent requires a core distortion of 2.9 to 4.0 mm under a load of 100 kg – the Precept EV Extra Spin has a core distortion of 2.9 mm under a load of 100 kg (*see* Ex. 20, BSP 89622-26);
- Claim 1 of the '817 patent requires the ratio of core distortion under a load of 100 kg divided by ball distortion under a load of 100 kg to be between 1.0 and 1.3 – the Precept EV Extra Spin has a ball distortion of 2.79 under a load of 100 kg, so that the ratio of its core distortion (2.9 mm) divided by its ball distortion (2.79 mm) is 1.1 (*see* Ex. 20, BSP 89622-26);
- Claim 1 of the '817 patent requires that the cover consist of an ionomer resin as a resin component – the cover of the Precept EV Extra Spin was made from Surlyn 7930, which is an ionomer resin (*see* Ex. 20, BSP 89622-26); and

- Claim 1 of the '817 patent requires that the cover have a Shore D hardness of up to 60 – the Precept EV Extra Spin has a Shore D hardness of 52 (*see* Ex. 20, BSP 89622-26).

The only difference between Claim 1 of the '817 patent and the Precept EV Extra Spin is in cover thickness. Claim 1 requires that the cover have a thickness of 1.3 to 1.8 mm, whereas the Precept EV Extra Spin had a cover thickness of 2.0 mm – a difference of only 0.2 mm. (*See* Ex. 20, BSP 89622-26). Recent testing of Precept EV Extra Spin golf balls sold in the United States in March of 1994 and obtained by Acushnet at that time confirms that those manufacturing targets were implemented in the golf balls sold in the United States at that time. (*See* Exhibit 24). Thus, Bridgestone's own Precept EV Extra Spin comes literally within 0.2 mm of anticipating the '817 patent.

Interestingly, despite the similarity of Bridgestone's Precept EV Extra Spin golf ball to claim 1 of the '817 patent – and its anticipation of the originally-filed Japanese priority document – Bridgestone never disclosed the existence of that ball to the examiner. Bridgestone filed a single information disclosure statement during the prosecution of the '817 patent, in which it identified only three prior art patents and no golf balls. (*See* Ex. 23, Apr. 12, 1996 Information Disclosure Statement).

E. The '817 Patent Is Anticipated By Japanese Kokai Publication No. 60-163673

I have concluded that claim 1 is invalid as anticipated by Bridgestone's own Japanese Kokai Publication No. 60-163673 ("JP '673") (Ex. 25).

The Japanese Patent Office published JP '673 on August 26, 1985, close to ten years before Bridgestone's earliest claimed foreign filing date of October 14, 1994. The unexamined application was filed by Bridgestone Corporation and names Tetsuya Shima and Michitsugu Kikuchi as the inventors. By predating the October 14, 1994 priority date claimed by Bridgestone for the '817 patent, I understand that JP '673 qualifies as prior art.

> Table 4 when the solid core has a deformation of 3.3 to 3.7mm under a constant load of 100kg.

(Ex. 25, JP '673 at 401).

Acting under my supervision, Acushnet employees used those teachings to construct golf ball cores with (a) a range of core diameters (36 mm to 40 mm) disclosed in the specification and (b) distortions from 3.3 mm to 3.7 mm under a 100 kg load, as disclosed in Table 4. (JP '673 at 399, Table 4). For the cover, they used a 1.75 mm thick blend of Himilan 1855 and titanium dioxide from Table 4.

a. Core Composition

As noted above, the specification teaches a composition "… containing 100 parts by weight of a polybutadiene containing 1-4 cis-bond, 10 to 30 parts by weight of acrylic and/or methacrylic acid, 10 to 70 parts by weight of zinc oxide, and 0.5 to 6 parts by weight of peroxide …." The specification also teaches the use of metallic salts of unsaturated carboxylic acids (i.e. acrylic and methacrylic acids) and so zinc diacrylate (ZDA) was used in the formulas in place of acrylic acid. The stoichiometric equivalent of the formulation taught in the specification using zinc diacrylate is as follows:

- 100 parts of polybutadiene containing 1-4 cis-bond
- 14.4 to 43.2 parts of ZDA
- 4.4 to 64.4 parts of zinc oxide (compensating for the zinc oxide used to form ZDA)
- 0.5 to 6 parts of peroxide

The actual recipes used to make the four cores used in this experiment were:

Sample Set No. 1: 36 mm diameter core, distortion of 3.3 mm @ 100 kg

- 100 parts of polybutadiene (Dow BR 1220)
- 25 parts of ZDA
- 5 parts of zinc oxide
- 0.5 parts of peroxide (Trigonox 265)
- 0.2 parts orange color masterbatch
- 18 parts Barium Sulfate (Polywate 325)

Sample Set No. 2: 36 mm diameter, distortion of 3.7 mm @ 100 kg

c. Cover Material Formulation

As noted above, the reference teaches cover compositions containing 100 parts by weight of an ionomer resin and 20 parts by weight of titanium dioxide. Further, Table 4 teaches Himilan 1855 as an example of ionomer resin. We made the blend of 20 parts titanium dioxide in 100 parts of Himilan 1855 using a Werner & Pfleiderer Twin Screw Compounder type ZSK-30. The cover material was injection molded into half shells for compression molding around the sample cores. Half shells were made in two sizes to mold onto the two different core diameters. A 2-inch diameter sample disc was compression molded to measure Shore D hardness. The hardness was measured 4 days after molding. The Shore D hardness was 51.0 (average of 5 measurements, 51.0, 50.8, 50.6, 50.3, 52.4). While I understand that Shore D hardness may change within two weeks of molding, it will not increase by more than a few Shore D points, so I would expect the measurements at two weeks to be under 60.

d. Cover Molding

Covers were compression molded onto the four sample sets. In all cases a cover thickness of 1.75 mm was achieved. The two 36 mm core types were cover molded in a 41 mm mold and ground in a centerless grinding machine to the desired diameter of 39.5 mm. The two 40 mm core types were cover molded in a 43.8 mm mold.

e. Ball Properties

The diameter, 100 kg distortion, and cover hardness of the molded balls were measured. The data is below.

Sample Set No. 1:

Sample	Ball Diameter	Cover Thickness	100 kg Distortion	Core Distortion/Ball Distortion	Cover Shore D Hardness
Ball 1	39.5 mm	1.75 mm	3.0 mm	1.10	53.8
Ball 2	39.5 mm	1.75 mm	3.0 mm	1.10	54.5
Ball 3	39.5 mm	1.75 mm	3.1 mm	1.06	55.0
Ball 4	39.5 mm	1.75 mm	3.0 mm	1.10	55.2
Ball 5	39.5 mm	1.75 mm	3.0 mm	1.10	54.7
Ball 6	39.5 mm	1.75 mm	3.0 mm	1.10	55.0

Sample Set No. 2:

Sample	Ball Diameter	Cover Thickness	100 kg Distortion	Core Distortion/Ball Distortion	Cover Shore D Hardness
Ball 1	39.5 mm	1.75 mm	3.4 mm	1.09	54.4
Ball 2	39.5 mm	1.75 mm	3.4 mm	1.09	54.9
Ball 3	39.5 mm	1.75 mm	3.4 mm	1.09	54.6
Ball 4	39.5 mm	1.75 mm	3.4 mm	1.09	54.0
Ball 5	39.5 mm	1.75 mm	3.4 mm	1.09	54.5
Ball 6	39.5 mm	1.75 mm	3.4 mm	1.09	54.8

Sample Set No. 3:

Sample	Ball Diameter	Cover Thickness	100 kg Distortion	Core Distortion/Ball Distortion	Cover Shore D Hardness
Ball 1	43.8 mm	1.75 mm	3.1 mm	1.06	51.5
Ball 2	43.8 mm	1.75 mm	3.1 mm	1.03	51.0
Ball 3	43.8 mm	1.75 mm	3.1 mm	1.03	51.9
Ball 4	43.8 mm	1.75 mm	3.0 mm	1.07	50.2
Ball 5	43.8 mm	1.75 mm	3.0 mm	1.07	52.2
Ball 6	43.8 mm	1.75 mm	3.1 mm	1.06	52.1

Sample Set No. 4:

Sample	Ball Diameter	Cover Thickness	100 kg Distortion	Core Distortion/Ball Distortion	Cover Shore D Hardness
Ball 1	43.7 mm	1.75 mm	3.6 mm	1.03	49.8
Ball 2	43.7 mm	1.75 mm	3.6 mm	1.06	49.2
Ball 3	43.7 mm	1.75 mm	3.6 mm	1.03	49.5
Ball 4	43.7 mm	1.75 mm	3.6 mm	1.03	49.5
Ball 5	43.7 mm	1.75 mm	3.6 mm	1.06	49.6
Ball 6	43.7 mm	1.75 mm	3.6 mm	1.06	49.2

Based on that data, I conclude that the examples in Table 4 of JP '673 inherently disclose this limitation.

The results of my tests were not surprising. The ratio of core distortion divided by ball distortion is neither a new concept nor was it invented by Bridgestone. All solid golf balls inherently have a ratio of core distortion divided by ball distortion. The ratio claimed by the '817 patent – 1.0 to 1.3 – means only that the golf ball, which consists of a core plus a cover, is

going to have the same or slightly less deflection under a 100 kg load than the deflection of the core alone.[5]

The claimed ratio is self-evident when one considers the structure of the golf balls such as those taught by the '817 patent. As acknowledged by Bridgestone during prosecution, the '817 patent claims a soft core. (Ex. 23, Mar. 4, 1997 Amendment at 7) ("The present core distortion of 2.9 to 4.0 mm under a load of 100 kg means that the present core is very soft."). The cover material claimed by the '817 patent is a soft ionomer resin, but would be expected to reduce the core distortion. In fact, one of the primary reasons for putting the ionomer cover on the core is to reduce the distortion of the core at club impact. Thus, when you cover a soft core with an ionomer, the ball necessarily will deflect by either the same amount or slightly less than the core alone. As a result, the ratio of core distortion divided by ball distortion will be either 1 (when the distortion of the ball is the same as the core) or slightly greater than 1 (when the distortion of the ball is slightly less than the distortion of the core). Further, the cover taught by the '817 patent is a relatively thin. (*See* Ex. 23, Mar. 4, 1997 Amendment at 7) ("the cover thickness is 1.3 to 1.8 mm which is thin"). With a thin cover, such as the 1.75 mm cover disclosed in Table 4 of JP '673, the effect on ball distortion will be even less, so that the ratio will be closer to 1.

For example, the Precept EV Extra Spin provides an example of the ratio. As shown above, the Precept EV Extra Spin golf ball used the same basic core and cover as those taught by the '817. The one exception is that the cover of the Precept EV Extra Spin is 2.0 mm – 0.2 mm outside the range claimed by the '817 patent. If anything, one would expect the thicker cover to decrease the ball's distortion relative to the core distortion and drive the ratio higher. Nevertheless, the ratio for the Precept EV Extra Spin was only 1.1, well within the claimed range. (*See* Ex. 24).

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[5] Note that even a one-piece golf ball would fall within the claimed range. In that case, the core and the ball are the same, and thus have the same distortion. As a result, the ratio of core distortion divided by ball distortion would be a number divided by itself, which is 1.

Yet another such example is provided by GB '628. GB '628 discloses an example of a control core with a core distortion of 2.61 mm. (Ex. 26, GB '628 at 15). It further discloses golf balls with distortions under a 100 kg load of 2.39 mm to 2.57 mm, made from the same list of ingredients and in the same amounts as the control core. (Ex. 26, GB '628 at 10, 14). By dividing the control core distortion by the disclosed ball distortions, GB '628 teaches a ratio of 1.01 to 1.09. The lower value is the control core distortion of 2.61 mm divided by a ball distortion of 2.57 mm, while the higher value is the control core distortion of 2.61 mm divided by the ball distortion of 2.39 mm. The range of distortion ratios taught by GB '628 is quite narrow and entirely within the range claimed by the '817 patent.

As demonstrated by the above examples, the claimed distortion ratio is not novel and was not invented in the '817 patent. JP '673, the Precept EV Extra Spin, and GB '628 – all from Bridgestone – all possessed the claimed ratio property before it was taught by the '817 patent and all have ratios slightly greater than 1 and well under 1.3.

In my experience manufacturing golf balls and in the experience of the golf ball manufacturers to whom I have spoken, it is generally understood that the addition of an ionomer cover to a core will decrease the distortion of the golf ball. The basic physics of golf balls dictate that a soft core covered by an ionomer cover will have a distortion under a 100 kg load that is either the same or slightly less than the distortion of the core itself, resulting in a distortion ratio that is 1 or slightly greater than 1.

4. "said cover consists of an ionomer resin as a resin component"

As noted above, Table 4 of JP '673 discloses the use of Himilan 1856 and 1855 in the cover. (Ex. 25, JP '673 at 401, Table 4). Himilan® is the trade name for a family of ionomer resins manufactured in Japan by DuPont-Mitsui Polychemical Co., Ltd., which are equivalent to the Surlyn® family of ionomer resins manufactured in the United States by DuPont. While I understand that the parties dispute whether this limitation in the '817 patent allows blends of ionomer resins as the resin component, there is no dispute that this limitation is met by a cover

was less than 60, as shown above. Thus, although JP '673 does not explicitly disclose a Shore D cover hardness within the claimed range as measured on the ball, that property is inherent to the examples in Table 4 using Himilan 1855.

That limitation is also inherent under Bridgestone's proposed Shore D measurement method. In addition to measuring the cover hardness on the ball, I formed plaques of the cover compositions described above using Himilan 1855 and measured them with a Shore D durometer according to ASTM Standard D 2240. Again, the result was less than 60 for each sample, as shown above. Thus, I conclude that this limitation is inherently disclosed by JP '673.

Based on the foregoing analysis, I conclude that JP '673 invalidates claim 1 of the '817 patent.

F. Alternatively, The '817 Patent Is Invalid As Obvious In Light Of JP '673

The only limitations from the '817 patent not explicitly taught by JP '673 are (1) the claimed ratio of core distortion divided by ball distortion and (2) the Shore D hardness of the cover. As shown above, however, those limitations were neither novel nor invented by Bridgestone – golf balls constructed from Table 4 of JP '673 meet those limitations, as do Bridgestone's Precept EV Extra Spin golf ball and the golf balls taught in Bridgestone's GB '628 reference. Even if JP '673 did not inherently disclose those limitations, however, it would have been obvious to one of ordinary skill in the art.

1. The Claimed Ratio Of Core Distortion Divided By Ball Distortion Would Have Been Obvious To One Of Ordinary Skill In The Art

As shown by Bridgestone's own Precept EV Extra Spin golf ball and GB '628 reference, the basic physics of placing thin ionomer cover over a soft core dictate that the ball will distort slightly less than the core alone, due to the restraining effect of the cover layer on the core. Thus, any ratio of core distortion divided by ball distortion for such a construction would be either 1 (where the ball distortion and core distortion are the same) or slightly greater than 1

EXHIBIT D

SHINSHU SERVICES, INC.
JAPANESE LANGUAGE LEGAL SUPPORT AND CONSULTING

BRENDA K. SEAT, ESQ.

Certification

I, Brenda Kay Seat, do hereby certify the following:

I am fluent in the English and Japanese languages. I have translated and/or reviewed the translation of the Japanese document identified as:

Japanese Unexamined Patent 60-163673

and find it to be a true and accurate translation to the best of my knowledge and ability.

Signature B.K. Seat

Brenda Kay Seat, Esq.

Date May 3, 2006

SIX WHITEHALL COURT, SILVER SPRING, MARYLAND 20901 • TEL.: 301-593-3980 • FAX: 301-681-9243
BSEAT@SHINSHUSERVICES.COM • WWW.SHINSHUSERVICES.COM

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May 3, 2006

(19) Japan Patent Office (JP) (11) Unexamined Patent Application Publication No.
(12) Publication of Unexamined Patent Application (A) 60-163673
(43) Kokai Date: August 26, 1985

(51) Int.C[4] Identification Symbol JPO File Number
A63B 37/00 2107-2C

Request for Examination: Not Requested, Number of Claims: 1 (4 Pages Total)

(54) Title of the Invention: A Solid Golf Ball
(21) Application Number: 59-20418
(22) Application Date: February 7, 1984
(72) Inventor: Tetsuya Shima, 1278-21 Koda-machi, Totsuka-ku, Yokohama-city
(72) Inventor: Michitsugu Kikuchi, 1274-1 Totsuka-machi, Totuska-ku, Yokohama-city
(71) Applicant: Bridgestone Corporation., 10-1 Kyobashi 1-chome, Chuo-ku, Tokyo
(74) Agent: Patent Attorney, Takashi Kojima

Specification

1. Name of the Invention
A Solid Golf Ball

2. Claims

1. A solid golf ball comprising a solid core formed from a high polymer compounding agent and a cover composed primarily with an ionomer resin, wherein, the solid core has a deformation of 1.5 to 4mm under a constant load of 100kg; and the cover uses a material having a flexural modulus of 500 to 4,000kg/cm^2 so that the thickness of the cover becomes 0.7 to 3mm.

2. A solid golf ball according to claim 1, wherein, the solid core has a deformation of 1.8 to 2.2mm under a constant load of 100kg; and the cover uses a material having a flexural modulus of 700 to 4000kg/cm^2 so that the thickness of the cover becomes 1.0 to 1.9mm.

3. A solid golf ball according to claim 1, wherein, the solid core has a deformation of 2.3 to 2.7mm under a constant load of 100kg; and the cover uses a material having a flexural modulus of 700 to 4000kg/cm^2 so that the thickness of the cover becomes 1.5 to 2.mm.

4. A solid golf ball according to claim 1, wherein, the solid core has a deformation of 2.8 to 3.2mm under a constant load of 100kg; and the cover uses a material having a flexural modulus of 900 to 4000kg/cm^2 so that the thickness of the cover becomes 1.7 to 2.3mm.

5. A solid golf ball according to claim 1, wherein, the solid core has a deformation of 3.3 to 3.7mm under a constant load of 100kg; and the cover uses a material having a flexural modulus of 1000 to 4000kg/cm^2 so that the thickness of the cover becomes 1.9 to 2.4mm.

3. Detailed Description of the Invention

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The present invention relates to solid golf balls such as two-piece golf balls having a solid core and an ionomer resin cover enclosing the solid core. More particularly, it relates to such solid golf balls having improved hitting feel and excellent durability.

Well known in the art are solid golf balls, for example, two-piece golf balls which are generally formed by milling polybutadiene rubber, methacrylic acid, zinc oxide or peroxide and thermoforming the composition into a solid core and covering the core with a cover. In these solid golf balls, for example, two-piece golf balls, ionomer resins having excellent cut resistance are generally used to form the cover. The solid golf balls having a cover formed of such an ionomer exhibit excellent durability. However, compared with conventional thread-wound balls, these solid golf balls show disadvantageous characteristics such as causing unpleasant hitting feel. Some attempts were conventionally made in the past to render the hitting feel of solid golf balls soft (1) by reducing the hardness of the solid core, (2) by thinning the cover having cut resistance, or (3) by molding the cover from a softer material. These attempts failed to produce satisfactory balls. Methods (1) and (2) resulted in balls having inferior durability, and balls tended to be cut easily when hit. With method (3), balls showed inferior initial velocity when hit.

As a result of many diligent studies to achieve the above-described objective and to obtain a solid golf ball having excellent durability and high initial velocity when hit, the inventors of the present invention discovered that a solid golf ball that has a solid core comprising of a high polymer compounding agent and an ionomer-resin cover enclosing the solid core, in which the solid core has a deformation of 1.5 to 4mm under a constant load of 100kg and the cover uses a material having a flexural modulus of 500 to 4,000kg/cm^2 so that the thickness of the cover becomes 0.7 to 3mm, achieves the objective very effectively.

More specifically, the inventors found that durability worsened when simply reducing the hardness of the solid core or thinning the cover in order to render the hitting feel soft or that the initial velocity dropped when simply molding the cover from a softer material. Instead, by combining a solid core having the hardness of the above-described range and a cover having flexural modules and thickness in the foregoing range, the golf ball unexpectedly exhibited soft hitting feel but did not reduce durability or initial velocity. Then, the inventors concluded that the golf ball having the equivalent hitting feel to that of a thread-wound ball was obtained when specifying the combination of the hardness of the core and the flexural modules and thickness of the cover. The present invention was thus invented.

The following describes the present invention in more detail.

The present invention provides a solid golf ball having a solid core formed from a high polymer compounding agent and a cover primarily composed with an ionomer resin. The solid core has a deformation of 1.5 to 4mm under a constant load of 100kg and the cover uses a material having a flexural modulus of 500 to 4,000kg/cm^2 so that the thickness of the cover becomes 0.7 to 3mm. The term deformation under a constant load of 100kg designates the distance of deformation of a spherical solid core occurring when a load of 100kg is applied to the core. The term flexural modules refers to the value measured using ASTM D-790-4.

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In the golf ball according to the present invention, when the solid core has a deformation of 1.8 to 2.2mm under a constant load of 100kg, it is preferable that the cover uses a material having a flexural modulus of 700 to 4000kg/cm^2 so that the thickness of the cover becomes 1.0 to 1.9mm. When the solid core has a deformation of 2.3 to 2.7mm under a constant load of 100kg, preferably the cover uses a material having a flexural modulus of 700 to 4000kg/cm^2 so that the thickness of the cover becomes 1.5 to 2.0mm. When the solid core has a deformation of 2.8 to 3.2mm under a constant load of 100kg, desirably the cover uses a material having a flexural modulus of 900 to 4000kg/cm^2 so that the thickness of the cover becomes 1.7 to 2.3mm. When the solid core has a deformation of 3.3 to 3.7mm under a constant load of 100kg, it is desirable that the cover uses a material having a flexural modulus of 1000 to 4000kg/cm^2 so that the thickness of the cover becomes 1.9 to 2.4mm. By making the hardness of the solid core, the flexural modulus and thickness of the cover within the above-described ranges, more assuredly a ball having improved hitting feel is obtained.

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There is no limitation to the composition of high polymer compounding material that forms a solid core having a deformation under a constant load of 100kg. A polybutadiene rubber can be formed using crosslinking agents such as unsaturated carboxylic acid or metallic acid thereof. A polybutadiene rubber can also be formed using crosslinking agents such as unsaturated carboxylic ester. A polybutadiene rubber further can be cross-linking formed using unsaturated carboxylic acid or a combination of unsaturated carboxylic acid and metallic salt thereof. The polybutadiene rubber compositions may be blended with a suitable amount of zinc oxide, organic peroxide, filling agent, etc. More preferably, for example, the solid core compositions are compositions containing 100 parts by weight of a polybutadiene containing 1-4 cis-bond, 10 to 30 parts by weight of acrylic and/or methacrylic acid, 10 to 70 parts by weight of zinc oxide, and 0.5 to 6 parts by weight of peroxide wherein the compositions are cured by heating.

The solid cores formed from the above-described compositions normally have a diameter of 36.4 to 37.4mm and a weight of 35.4 to 36.2g for the small size. For the large size, the cores have a diameter of 37.4 to 38. 4mm and a weight of 33.4 to 34.2g.

The covers are formed mainly from ionomer resins in the present invention. The compositions are suitably selected from resins mainly composed of ionomer having a flexural modulus of 500 to 4000kg/cm^2. The compositions of the cover material are not particularly limited. Exemplary compositions may be ionomer resins combined with inorganic filling agents including titanium dioxide, zinc oxide, zinc stearate, magnesium stearate. The preferred ionomer resins are polymers formed by polymerizing a monoolefin with one or more members selected from the group consisting of unsaturated mono-and dicarboxylic acids having 3 to 8 carbon atoms and esters thereof and adding a crossslinking metal linkage thereto.

The solid cores in the present invention may be molded by any conventional techniques, for example, by milling the ingredients of the solid core composition described above in a conventional mill such as a Banbury mixer or a roll mill, compression or injection molding the composition in a core-forming mold, and heating the molded core. The heating temperatures may be 140°C to 180°C when the core composition contains dicumyl peroxide as the peroxide curing agent. Also, the method of covering the solid core with the cover is not particularly limited. One method is by placing the solid core in a pair of cover halves preformed in a semispherical shape and thermoforming them into an integral ball. Alternatively, the cover composition may be injection molded over the solid core to form a core-cover integrated ball.

As described above, the solid golf ball according to the present invention comprising of a solid core formed from high polymer compounding material and a cover mainly composed of an ionomer resin, in which the solid core has a deformation of 1.5 to 4mm under a constant load of 100kg and the cover uses a material having a flexural modulus of 500 to 4,000kg/cm^2 so that the thickness of the cover becomes 0.7 to 3mm, exhibits improved soft hitting feel and excellent durability as well as high initial velocity.

The following are the embodiment and comparative examples to specifically describe the present invention.

[Embodiment and Comparative Examples]

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Solid cores were prepared by combining 100 parts by weight of a polybutadiene, 20 to 80 parts by weight of zinc oxide, 10 to 30 parts by weight of acrylic acid and 0.5 to 4 parts by weight of dicumylperoxide, milling the compositions in 1000α Banbury mixer and a roll mill, and compression molding them at 150°C for 40 minutes. Solid cores were prepared so that the diameters range 36 to 40mm and deformations range 2.0 to 3.5mm under a constant load of 100kg.

Cover compositions containing 100 parts by weight of an ionomer resin and 20 parts by weight of titanium dioxide were injection molded over the above-described solid cores to form two-piece golf balls comprising covers having the flexural modulus and thickness as shown in Table 1 through Table 4. As ionomer resins, resins were chosen from Himilan® having various flexural modulus. (The product numbers of Himilan® used for Table 1 to Table 4 are noted in the table.). Table 1 shows the results when the solid core has a deformation of 1.8 to 2.2mm under a constant load of 100kg, Table 2 when the solid core has a deformation of 2.3 to 2.7mm under a constant load of 100kg, Table 3 when the solid core has a deformation of 2.8 to 3.2mm under a constant load of 100kg and Table 4 when the solid core has a deformation of 3.3 to 3.7mm under a constant load of 100kg.

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Then, professional golfers hit these balls to evaluate the hitting feel. The results are shown in Table 1 to Table 4. Evaluation is made in three ranks.

Evaluation ranks
E: Hitting feel is soft and very good.
G: Feel between rank E and rank B.
B: Hitting feel is hard and not good.

According to the results of Table 1 to Table 4, solid golf balls in the present invention were proved to exhibit soft and improved hitting feel. It was proved that solid golf balls having the following conditions were particularly favorable in the hitting feel. When the solid core has a deformation of 1.8 to 2.2mm under a constant load of 100kg, the cover uses a material having a flexural modulus of 700 to 2000kg/cm^2 so that a thickness of the cover becomes 1.0 to 1.9mm. When the solid core has a deformation of 2.3 to 2.7mm under a constant load of 100kg, the cover uses a material having a flexural modulus of 700 to 2500kg/cm^2 so that a thickness of the cover becomes 1.5 to 2.0mm. When the solid core has a deformation of 2.8 to 3.2mm under a constant load of 100kg, the cover uses a material having a flexural modulus of 900 to 4000kg/cm^2 so that a thickness of the cover becomes 1.7 to 2.3mm. When the solid core has a deformation of 3.3 to 3.7mm under a constant load of 100kg, the cover uses a material having a flexural modulus of 1000 to 4000kg/cm^2 so that a thickness of the cover becomes 1.9 to 2.4mm.

Table 1: When the solid core has a deformation of 1.8 to 2.2mm under a constant load of 100kg

Cover Thickness (mm)	Flexural modulus of the cover (kg/cm^2) (Himilan® product No.)					
	714 (1856)	917 (1855)	1530 (1702)	1730 (1650)	2650 (1600)	3770 (1605)
1.0	E	E	E	E	E	E
1.5	E	E	E	E	E	B
1.75	E	E	E	E	B	B
2.0	G	G	B	B	B	B
2.25	B	B	B	B	B	B

Table 2: When the solid core has a deformation of 2.3 to 2.7mm under a constant load of 100kg

Cover Thickness (mm)	Flexural modulus (kg/cm^2) of the cover (Himilan® product No.)					
	714 (1856)	917 (1855)	1530 (1702)	1730 (1650)	2650 (1600)	3770 (1605)
1.0	B	B	G	G	G	G
1.25	G	G	G	G	G	G
1.5	E	E	E	E	E	B
1.75	E	E	E	E	E	B
2.0	E	E	B	B	B	B
2.25	B	B	B	B	B	B
2.5	B	B	B	B	B	B

Table 3: When the solid core has a deformation of 2.8 to 3.2mm under a constant load of 100kg

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Cover Thickness (mm)	Flexural modulus (kg/cm^2) of the cover (Himilan® product No.)					
	714 (1856)	917 (1855)	1530 (1702)	1730 (1650)	2650 (1600)	3770 (1605)
1.5	B	B	G	G	G	G
1.75	E	E	E	E	E	E
2.0	E	E	E	E	E	E
2.25	E	E	E	E	E	E
2.5	G	G	B	B	B	B

Table 4: When the solid core has a deformation of 3.3 to 3.7mm under a constant load of 100kg

Cover Thickness (mm)	Flexural modulus (kg/cm^2) of the cover (Himilan® product No.)					
	714 (1856)	917 (1855)	1530 (1702)	1730 (1650)	2650 (1600)	3770 (1605)
1.5	B	B	B	G	G	G
1.75	G	G	G	G	G	G
2.0	E	E	E	E	E	E
2.25	E	E	E	E	E	E
2.5	G	G	G	G	G	B
2.75	G	G	G	G	B	B

Patent applicant: Bridgestone Tire Co., Ltd.
Agent: Patent agent: Takashi Kojima

EXHIBIT E

THIS EXHIBIT HAS BEEN REDACTED IN ITS ENTIRETY

EXHIBIT F

LEXSEE 2007 US APP LEXIS 9233

Analysis
As of: Apr 30, 2007

IN RE OMEPRAZOLE PATENT LITIGATION ASTRA AKTIEBOLAG, AKTIEBOLAGET HASSLE, ASTRA MERCK ENTERPRISES INC., ASTRA MERCK INC., KBI-E, INC., KBI, INC., and ASTRAZENECA LP, Plaintiffs-Cross Appellants, v. ANDRX PHARMACEUTICALS, INC., and Defendant-Appellant, GENPHARM, INC., KREMERS URBAN DEVELOPMENT CO., and SCHWARZ PHARMA, INC., Defendants.

04-1562, 04-1563, 04-1589

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

2007 U.S. App. LEXIS 9233

April 23, 2007, Decided

PRIOR HISTORY: [*1] Appealed from: United States District Court for the Southern District of New York. Judge Barbara S. Jones. *In re Omeprazole Patent Litig., 2004 U.S. Dist. LEXIS 15619 (S.D.N.Y., Aug. 9, 2004)* *In re Omeprazole Patent Litig., 2004 U.S. Dist. LEXIS 9447 (S.D.N.Y., May 19, 2004)*

DISPOSITION: AFFIRMED.

CASE SUMMARY:

PROCEDURAL POSTURE: In a patent infringement action that was tried in four phases, plaintiff patentee and defendant competitor appealed from judgments in which the United States District Court for the Southern District of New York found (1) that defendant literally infringed claims of a patent reciting a process for creating an in situ separating layer in a gastric acid inhibiting drug and (2) that the asserted claims were anticipated or obvious.

OVERVIEW: Plaintiff's patent claimed a process for making a pharmaceutical formulation composed of a core containing an active alkaline reacting compound (ARC), a water soluble separating layer, and an enteric coating layer. The separating layer was created by an in situ reaction between the enteric-coating material and the ARC in the core. Defendant, which had sought to market a generic version of plaintiff's drug, argued that its product did not infringe plaintiff's patent because the separating layer in defendant's product contained talc and was not water soluble. The court determined that the district court did not err in finding that plaintiff's claim of "a water soluble salt" permitted inclusion of talc in the separating layer. Although a prior patent application did not claim an in situ formation of a separating layer, the district court correctly found inherent anticipation because there was evidence that in situ formation resulted from the prior art even though the process was not recognized at the time the prior patent application became public. The district court did not err in concluding that it would have been obvious to one skilled in the art to substitute one ARC for another.

OUTCOME: The court affirmed the district court's judgments.

LexisNexis(R) Headnotes

Patent Law > Infringement Actions > Claim Interpretation > General Overview
Patent Law > Jurisdiction & Review > Standards of Review > Clearly Erroneous Review
[HN1] An infringement analysis proceeds as a two-step process: claim construction, followed by comparison of the claims to the accused device. The United States Court of Appeals for the Federal Circuit reviews claim

construction without deference and infringement for clear error.

Patent Law > Anticipation & Novelty > Elements
[HN2] Anticipation requires disclosure of each and every claim limitation in a single prior art reference, either explicitly or inherently. An anticipation analysis requires a comparison of the construed claim to the prior art.

Patent Law > Claims & Specifications > General Overview
Patent Law > Infringement Actions > Claim Interpretation > General Overview
[HN3] Absent some clear intent to the contrary, the court does not import examples from a specification into claims.

Patent Law > Anticipation & Novelty > Accidental Anticipation & Inherency
[HN4] A prior art reference without express reference to a claim limitation may nonetheless anticipate by inherency. Inherency is not necessarily coterminous with knowledge of those of ordinary skill in the art. Artisans of ordinary skill may not recognize the inherent characteristics or functioning of the prior art.

Patent Law > Anticipation & Novelty > Accidental Anticipation & Inherency
[HN5] The discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's function, does not render the old composition patentably new to the discoverer. Newly discovered results of known processes are not patentable because those results are inherent in the known processes. The recognition of a new aspect of a known process is not a patentable invention of a novel process.

Patent Law > Nonobviousness > Evidence & Procedure > Fact & Law Issues
[HN6] Obviousness under *35 U.S.C.S. § 103* is a legal conclusion based on underlying factual determinations.

Patent Law > Inequitable Conduct > General Overview
Patent Law > Jurisdiction & Review > Standards of Review > Abuse of Discretion
Patent Law > Jurisdiction & Review > Standards of Review > Clearly Erroneous Review
[HN7] The United States Court of Appeals for the Federal Circuit reviews an ultimate inequitable conduct determination for abuse of discretion and the underlying determinations including materiality and intent under the clearly erroneous standard.

Patent Law > Inequitable Conduct > Burdens of Proof
[HN8] A party claiming that a patentee has unclean hands bears the burden of proving by clear and convincing evidence that the patentee acted with unclean hands.

Patent Law > Jurisdiction & Review > Standards of Review > Abuse of Discretion
Patent Law > Jurisdiction & Review > Standards of Review > Clearly Erroneous Review
Patent Law > Remedies > Collateral Assessments > Attorney Fees
[HN9] The United States Court of Appeals for the Federal Circuit reviews a denial of attorney fees under *35 U.S.C.S. § 285* for an abuse of discretion; however, the court reviews the factual determination of whether a case is exceptional under § 285 for clear error. In addition, the court reviews the meaning of the term "prevailing party" without deference.

COUNSEL: Errol B. Taylor, Milbank, Tweed, Hadley & McCloy LLP, of New York, New York, argued for plaintiffs-cross appellants. With him on the brief were Fredrick M. Zullow and Lawrence T. Kass; and Jay I. Alexander, of Washington, DC. Of counsel were John M. Griem, Jr. and Claire A. Gilmartin.

Margaret A. Dale, Proskauer Rose LLP, of New York, New York, argued for defendant-appellant. With her on the brief were Louis M. Solomon and Jeremy R. Kasha. Of counsel on the brief were James V. Costigan and Martin P. Endres, Hedman & Costigan, of New York, New York.

JUDGES: Before NEWMAN, RADER, and BRYSON, Circuit Judges. Opinion for the court filed by Circuit Judge RADER. Opinion concurring in part and dissenting in part filed by Circuit Judge NEWMAN.

OPINION BY: RADER

OPINION: RADER, Circuit Judge.

Astra Aktiebolag, Aktiebolaget Hssle, Astra Merck Enterprises Inc., Astra Merck Inc., KBI-E Inc., KBI Inc., Astra Pharmaceuticals L.P., and AstraZeneca L.P. (collectively Astra) filed patent infringement suits against several pharmaceutical companies that were seeking permission from [*2] the Food and Drug Administration (FDA) to market generic versions of Prilosec (R), Astra's gastric acid inhibiting drug. The United States District

Court for the Southern District of New York tried the case in four phases. Following a fifty-two day bench trial, the district court decided in Phases I and III that Andrx's product infringes two of Astra's patents, *U.S. Patent Nos. 4,786,505 (the '505 patent)* and *4,853,230 (the '230 patent). Astra Aktiebolag v. Andrx Pharm., Inc., 222 F. Supp. 2d 423 (S.D.N.Y. 2002)*. This court affirmed that judgment. *In re Omeprazole Patent Litig., 84 Fed. App'x. 76, 2003 WL 22928641 (Fed. Cir. 2003)* (Omeprazole II).

This appeal involves Phases II and IV of the same litigation. The district court entered a final judgment finding that Andrx Pharmaceuticals, Inc. (Andrx) literally infringed claims 1, 2, 3, 7, 9, 16, and 20-21 of Astra Aktiebolag's *United States Patent No. 6,013,281 (the '281 patent)*. The trial court also entered several other judgments about the enforceability of that patent and other Astra patents. In re Omeprazole Patent Litig., M-21-81 (BSJ), MDL Docket No. 1291 (S.D.N.Y. July 15, 2004) ([*3] Final Judgment). At the same time, however, the district court also found the asserted claims of Astra's *'281 patent* anticipated or obvious. Final Judgment, slip op. at 2. Detecting no error of law or fact, this court affirms.

I

Phases I and III of this case produced judgments of patent infringement against Andrx and other defendants. This case, however, involves only the *'281 patent* and one defendant, Andrx. As set out in the district court's thorough 38-page opinion, Phase II involves infringement and validity of the *'281 patent*; Phase IV involves Andrx's defenses of inequitable conduct and unclean hands. *In re Omeprazole Patent Litigation, M-21-81 (BSJ), MDL Docket No. 1291, 2004 U.S. Dist. LEXIS 9447 (S.D.N.Y. May 19, 2004)* (Omeprazole III). In addition, unlike the patents that claimed a formulation in Phases I and III, the *'281 patent* claims only a process.

Omeprazole is the generic name for Prilosec (R). *Astra Aktiebolag v. Andrx Pharm., Inc., 222 F. Supp. 2d 423, 433 (S.D.N.Y. 2002)* (Omeprazole I). Omeprazole inhibits the production of gastric acid through a unique mechanism. *Id. at 434*. After a complex absorption process, Omeprazole transforms into [*4] its active species in the parietal cells (acid-producing cells in the stomach lining) and inhibits acid production. Id. However, omeprazole degrades in acidic and neutral environments. Therefore, it must be protected from contact with gastric juices while traveling to the parietal cells. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *4*. Thus, an omeprazole formulation needs a protective enteric coating around the core containing the active alkaline reacting compound (ARC) and a separating layer between that core and the coating. Id.

The *'281 patent* recites a method for making this pharmaceutical formulation. The pharmaceutical formulation is composed of a core that contains a proton pump inhibitor like omeprazole to decrease gastric acid secretion, a water soluble separating layer, and an enteric coating layer. *'281 patent*, Abstract. Specifically, the *'281 patent* recites a process for creating the separating layer by causing an in situ reaction involving the enteric-coating material and the ARC in the core. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *4*. The reaction creates a salt form of the enteric-coating polymer between the core and the enteric-coating layer. Id. Thus, the *'281* process produces [*5] an omeprazole formulation with three distinct layers, but starts with only two of the three layers. Id. This in situ reaction requires a specific ARC concentration in the core. Claim 1, for example, requires more than 0.1 mmol/g dry ingredients in the alkaline-containing core:

> 1. A process for preparing an oral pharmaceutical formulation comprising the steps of:
>
> forming a core material comprising a proton pump inhibitor and at least one alkaline reacting compound [ARC], wherein the concentration of the alkaline reacting compound is about 0.1 mmol/g dry ingredients in the alkaline containing part of the core material, and
>
> applying an enteric coating polymer layer so as to surround the core material thereby forming in situ a separating layer as a water soluble salt product between the alkaline compound and the enteric coating polymer.

'281 Patent col.15 l.65 - col.16 l.9. The remaining claims all depend upon claim 1. Claim 9, which the district court found obvious, recites:

> 9. The process according to claim 1, wherein the alkaline reacting compound is an alkaline salt of phosphoric acid, carbonic acid or silicic acid.

'281 Patent col. [*6] 18 ll.3-5. The *'281* process adjusts the variables during the enteric-coating process to account for the particular enteric coatings. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *5*. The *'281 patent* states that "process parameters such as inlet air temperature, air flow, atomizer air flow and spraying rate are adjusted with respect to the equipment used for the process as well as the specific enteric coating polymer(s)." *'281 Patent* col. 8 ll.51-55. For example, when using hydroxypropyl methylcellulose acetate succinate LF (HPMCAS LF) for applying the enteric coating to a tablet, in the specification under "Examples," the patent states:

> 100 grams of . . . core material . . . was film-coated . . . as described below . . . . The dispersion was fed with a rate of 3.8 g/min. Inlet air temperature used was was 42 s[degrees]s C[sic] and flow was set to 40 Nm<3>/h. Atomizing airflow used was 2.1 Nm<3>/h, obtained with a pressure of 1.7 bar.

'281 Patent col.11 ll.41-65. After enteric coating, the specification also specifies an increase in the inlet air temperature to 60 s[degrees]s C for approximately five minutes. Id.

The *'281 patent* issued in the United States on January 11, 2000, with [*7] priority back to the February 9, 1995, Swedish application. However, in 1993, before Astra's Swedish filing, a Korean company, the Chong Kun Dan Corporation (CKD), began selling a form of omeprazole under the name "OMP" in Korea. CKD had filed an application (CKD Patent Application) with the Korean Intellectual Property Office (KIPO) for its OMP formulation. The CKD Patent Application became public at KIPO on April 20, 1993. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *25*. As a result, Astra questioned CKD about infringement of its Korean process patent for manufacturing omeprazole, a foreign sister to portions of Astra's *'505* (Astra's Korean Patent), which issued on November 22, 1988. CKD denied infringement in reliance on its own "unique know-how and . . . patents." CKD's Korean patent publications described compositions with no enteric coating processes. CKD maintained its enteric coating process--its "know how"--as a trade secret.

Astra filed suit in Korea against CKD for infringement. CKD initiated a proceeding in the KIPO, called a "negative confirmation of scope proceeding," seeking an advisory opinion that its process did not infringe Astra's Korean Patents.

This Korean Litigation and [*8] its associated KIPO proceedings turned on whether CKD's OMP product contained a subcoating. CKD relied on its two-step process to avoid Astra's Korean *'505 patent*. This two-step method--variously referred to in the documents as "Method A," method "No. (Ga)" or method "(Ka)ho" (collectively Method A)--did not involve a separate third step to make a sub-coating. CKD's description of Method A included core ingredients (omeprazole, arginine, microcrystalline cellulose, SLS, corn starch and magnesium stearate) and enteric coating ingredients (HPMCAS, ethyl citrate, talc, and sorbitan sesquioleate), but no enteric coating process conditions. Then, in September 1993, CKD submitted a modified list of ingredients for the Method A process, which added the coating agent "HPMC grade 2910," but still provided no enteric coating process conditions. The *'505 patent* required a separate application of a subcoating. *Omeprazole I, 222 F. Supp. 2d at 444-47*. To verify CKD's denials of any third sub-coating application step, Astra conducted various experiments on CKD's product. Astra's investigations and testing of CKD's batches MA00200 and MA00400 led Astra to repeatedly conclude that [*9] CKD's product in fact contained a subcoating. Thus, the Astra inventors continued to believe that CKD actually applied a conventional separating layer.

Thereafter, in June 1994, two of Astra's *'281 patent* inventors, Dr. Kurt Lovgren and Johan Lundberg, Ph.D., postulated instead that neutralizing enteric coating materials may produce a reaction in situ. With this new theory and the conflicting CKD information as a backdrop, Drs. Lundberg and Lovgren conceived the idea of forming a separating layer from enteric coating material neutralized by the ARC during the coating process. During their experiments to create an in situ separating layer, Drs. Lundberg and Lovgren did not know CKD's process for its product.

After much experimentation, on December 15, 1994, Dr. Lundberg developed the process conditions for making an in situ separating layer. Using process conditions, which included lower inlet air temperatures than those used during previous failed experiments, the latest experiments revealed that a separating layer would surprisingly form at a lower temperature, 42 s[degrees]s C, than previously used. This work became the foundation of the *'281 patent*.

Then, on December 21, 1994, for [*10] the first time, Dr. Lundberg received the process conditions for making CKD's omeprazole product. CKD's protocol for batch NA01200 required an enteric coating inlet air temperature of 70 s[degrees]s C--a temperature that, in As-

tra's tests, did not form in situ subcoatings. Testing also showed that batch NA01200 differed from earlier produced CKD products (MA00200 and MA00400). Then, in its December 1994 disclosure, CKD changed its September 1993 protocol. These changes added sorbitan sesquioleate and HPMC to its enteric coating recipe.

Finally, on January 5, 1995, Dr. Lundberg coated tablet cores with ingredients matching CKD's NA01200 batch record, employing his own process conditions, i.e., a processing inlet air temperature of 42 s[degrees]s C, and not the 70 s[degrees]s C temperature required by CKD's protocol. In an "In-House Pharmaceutical Report," Dr. Lundberg reported that all of the in situ separating layers from water-based enteric coatings formed at inlet air temperatures of 42 s[degrees]s C or lower.

On October 6, 1996, Astra Aktiebolag filed United States Application Number 09/413,521 (the '521 application), later issued as the *'281 patent*. On December 19, 2000, the [*11] United States Patent and Trademark Office (PTO) examiner issued an office action rejecting claims 1 through 20 of the application. On March 22, 2001, Astra filed a preliminary amendment to claims 21 through 52. In April, the PTO examiner allowed claims 21 through 52. Then, on July 20, 2001, the applicants submitted a petition to withdraw the '521 application from issuance and to submit an information disclosure statement. With the information disclosure statement, the applicants disclosed five documents with descriptions of the Korean proceedings (the Korean Information). After considering the Korean Information in September of 2001, the PTO examiner issued a notice of allowance on September 24, 2001. In the notice of allowance, the PTO examiner indicated that the claims were all patentable over the Korean prior art.

Meanwhile, CKD consistently represented to Astra, the applicant inventors, and the Korean courts that its product did not have, or need, a separating layer because CKD used a large amount of the specialized alkaline compound, arginine. In making this representation, CKD relied on its testing of CKD's batch NA01200 and the report of an outside expert, Dr. Jong-Kuk Kim, [*12] who viewed a production run for batch NA01200. The CKD Patent Application purports to disclose an omeprazole formulation whose stability relies on the zwitterionic amino acids (like arginine) in the core. The CKD Patent Application does not disclose any enteric coating process conditions or the basic details concerning enteric coatings. Notably, the CKD Patent Application expressly disavows the presence of a separating layer. CKD told the Korean court that its product also did not have a separating layer.

II

The district court found that Andrx literally infringed Astra's *'281 patent*. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *15-21*. Indeed, Andrx admitted that its process met all but one portion of claim 1 of the *'281 patent*--the portion requiring in situ formation of a separating layer. *Id., 2004 U.S. Dist. LEXIS 9447 at *15*. Regardless, Andrx disagrees with the district court's construction of "a water soluble salt" in claim 1. *'281 Patent* col.5 ll.42-43.

[HN1] The infringement analysis proceeds as a two-step process: claim construction, followed by comparison of the claims to the accused device. *N. Am. Container, Inc. v. Plastipak Packaging, Inc., 415 F.3d 1335, 1344 (Fed. Cir. 2005)*. This [*13] court reviews claim construction without deference, *Cybor Corp. v. FAS Tech., Inc., 138 F.3d 1448, 1455 (Fed. Cir. 1998)*, and infringement for clear error, *Power Mosfet Techs., L.L.C. v. Siemens AG, 378 F.3d 1396, 1406 (Fed. Cir. 2004)*.

Andrx argues that the district court erred in finding that its product infringes the *'281 patent* because it does not have a water soluble separating layer, but instead a layer composed of "almost 50% talc." According to Andrx, its separating layer with talc is not water soluble, but only disintegrates in water. Andrx asserts that disintegration is not soluble. Indeed, the *'505* and *'230 patents* claim a "subcoating which rapidly dissolves or disintegrates in water" and a "subcoating which is soluble or rapidly disintegrating in water," respectively. *Omeprazole I, 222 F. Supp. 2d at 446*.

The *'281 patent* indeed claims "a water soluble salt." *'281 Patent* col.16 l.8. The district court correctly discerned that this language permits the inclusion of talc. The language of claim 1 does not claim a separating layer that is water soluble. Claim 1 instead recites a salt product that is water soluble. The *'281 patent* [*14] specification, under "Summary of the Invention," describes the separating layer as comprising "a water soluble salt of an enteric coating polymer." *'281 Patent* col.5 ll.42-43 (emphasis added). A sentence later, the patent specification states: "a separating layer comprising a water soluble salt of an enteric coating polymer is obtained." *'281 Patent* col.5 ll.48-49 (emphases added). In addition, example 1 (and 4-7) of the *'281 patent* employs an enteric-coating layer that contains HPMCAS as well as triethylcitrate, sodium laurylsulphate, and talc. *'281 Patent* col.8 l.65-col.9 l.51. Thus, the district court correctly interpreted the *'281 patent* claim to permit inclusion of talc in the separating layer.

The trial court did not err by referring to the Omeprazole I opinion, which covered Phase I, because it pointed to a portion of its opinion that discussed the water solubility of the salt of the enteric coating. In Phase I, the district court found

> that the HPMCP-salt layer is film-forming and "soluble or rapidly disintegrating in water" as that phrase is used in the *'505* and *'230 patent* claims . . . [and that] the presence of talc does not [*15] affect this court's finding that the HPMCP-salt subcoating is soluble in water--it is expressly listed as an appropriate ingredient in the patents. (citations to record omitted).

222 F. Supp. 2d at 539 (emphasis added). This finding applied correctly to the *'281 patent* claims that do not require that the entire separating layer be water soluble, but only that the salt product be water soluble. In discussing the entire subcoating, the district court noted that the presence of talc does not affect the solubility of the salt. Id. In addition, the district court found in Phase II, that "[p]ersons skilled in the art would understand that each of those components [such as talc] are also present in the in situ layer generated by the claimed process, as well as in the enteric-coating layer." *Omeprazole III,2004 U.S. Dist. LEXIS 9447 at *14*. Indeed, the district court received testimony in Phase II that the contents of the enteric coat would inevitably become a part of the separating layer's salt because it is the result of a reaction between the HPMCP, which converts to a salt, in the enteric coat and the core, which contains an alkaline reacting compound:

> Dr. [*16] Davies explained that the salt layer is the result of a reaction between the HPMCP in the enteric-coating material and the DHP in the active layer. The talc from the enteric-coating spray remains in the HPMCP-salt layer when the HPMCP converts to the salt. (Davies Tr. 992:16-993:4 ("Talc is placed on the product in the enteric coating layer. It is still present during the formation of the HPMCP salt layer. . . . [The] salt layer [and] the enteric coating layer both contain talc.").)

Omeprazole I, 222 F. Supp. 2d at 530. Therefore, even though the district court was comparing Andrx's product to the *'505* and *'230 patent* claims, those claims, likewise, recite a water soluble salt product despite the presence of a talc during its formation. In addition, the *'281 patent*'s five preferred embodiments clearly state that they contain talc. As shown in testimony, the talc would still be present in the formation of the separating layer's salt-product. Thus, the district court did not err in its claim construction or its conclusion that Andrx's product infringed the *'281 patent*.

III

The district court found that the CKD patent application anticipated claims 1, [*17] 2, 3, 7, 16, and 20-21 of the *'281 patent*. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *3*. The CKD patent application became public on April 20, 1993, id., *2004 U.S. Dist. LEXIS 9447 at *25*, and contained all of the elements claimed in the anticipated claims. That application also disclosed the exact proportions of the principal ingredients in the *'281 patent*'s example 1. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *32*. The only *'281* "limitation" missing from the Korean application is the language "thereby forming in situ a separating layer."

[HN2] Anticipation requires disclosure of each and every claim limitation in a single prior art reference, either explicitly or inherently. *MEHL/Biophile Int'l Corp. v. Milgraum, 192 F.3d 1362, 1365 (Fed. Cir. 1999)*. An anticipation analysis requires a comparison of the construed claim to the prior art. *Helifix, Ltd. v. Blok-Lok, Ltd., 208 F.3d 1339, 1346 (Fed. Cir. 2000)*.

Astra asserts that the claim limitation, "forming in situ a separating layer," is not found in the CKD Patent Application. Astra also contends that the *'281 patent* contains an additional limitation requiring performance of the claimed process at a temperature below 42 s[degrees]s [*18] C.

At the outset, the asserted 42 s[degrees]s C "limitation" is only an example from the specification. [HN3] Absent some clear intent to the contrary, this court does not import examples from the specification into the claims. *Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1571 (Fed. Cir. 1988)* ("[E]mbodiments and examples appearing in the specification will not generally be read into the claims."). The 42 s[degrees]s C "limitation" does not appear in the claims. Moreover, the specification suggests variable temperatures, not a 42 Cdegrees requirement: "The process parameters such as inlet air temperature, air flow . . . are adjusted with respect to the equipment used as well as the specific enteric polymer . . . ." *'281 Patent* col.8 ll.51-57. Thus, the district court did not err in refusing to read Astra's alleged 42 s[degrees]s C limitation into Claim 1 of the *'281 patent*.

The "in situ formation of a separating layer" limitation presents a more difficult issue. The CKD patent application does not explicitly recite this feature. Therefore, anticipation turns on whether the CKD application inher-

ently disclosed "in situ" formation. The CKD [*19] application disavowed a subcoating and disclosed no process conditions to form a separating layer in situ.

Nonetheless, in finding inherent anticipation, the district court relied on and set out in its opinion the assertions Astra made during the Korean Litigation and KIPO proceedings:

> . that the CKD process (Method A) claimed in the CKD Patent Application resulted in the in situ formation of a separating layer in CKD's OMP tablet, *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *37*;
>
> . that Method A forms a separating layer, even though Method A does not have a separate step of applying the separating layer, id., *2004 U.S. Dist. LEXIS 9447 at *37*;
>
> . that Method A formed a separating layer and that such formation is inherent in the process of Method A, *id., 2004 U.S. Dist. LEXIS 9447 at *36-37*;
>
> > . "The construction of the inner coating layer formed in Method A is exactly that of the inner coating layer claimed in [the *'505 patent*]," id., *2004 U.S. Dist. LEXIS 9447 at *38*;
> >
> > . "[u]ltimately Method A contains the inner coating layer process," id.;
> >
> > . "the inner coating layer of the 'OMP tablet' is created instantly at the point of time when the substance of coating the enteric coating is sprayed, [*20] " id.;
> >
> > . According "to the content of the Expert opinion . . . with the start of the process of the enteric coating of the OMP tablet, HPMCAS, which is an enteric coating substance, instantly reacts with the L-arginine that is in the core and forms a thin membrane, i.e., an inner coating layer," id.;
> >
> > . Dr. Lovgren contended that the CKD process resulted in the formation of a separating layer, id.;
> >
> > . C.T. Rhodes, Ph.D., who Astra relied on in the proceedings in Korea against

CKD, opined that the CKD product contained an in situ layer, id..

Astra does not deny these statements. Furthermore, as noted by the district court: "If Astra had scientific proof with which to rebut or refute its prior admissions of inherency, it surely would have put on such proof. Astra did not." *Id., 2004 U.S. Dist. LEXIS 9447 at *40*. Furthermore, Dr. Umesh Banakar, Andrx's expert, testified that if a formulator followed the CKD process as described in the CKD Patent Application, the separating layer would form in situ "each and every time." *Id., 2004 U.S. Dist. LEXIS 9447 at *36*. In addition, the district court accorded "little if any weight" to Astra's contrary expert testimony from [*21] Dr. Robert Langer's testimony, in part because Astra did not provide Dr. Langer "with any of the submissions (including test results) on which Astra relied in Korea to prove that the formation of a separating layer naturally results from the CKD process." Id. The district court acting as factfinder found credible that evidence of inherent in situ formation, and we find no clear error in that determination. The district court did not settle for proof that in situ formation could result from the CKD process, as is suggested in the dissent; rather, the district court credited evidence that in situ formation does result from the CKD process.

As noted, [HN4] a prior art reference without express reference to a claim limitation may nonetheless anticipate by inherency. See *In re Cruciferous Sprout Litig., 301 F.3d 1343, 1349 (Fed. Cir. 2002)*. Moreover, "[i]nherency is not necessarily coterminous with knowledge of those of ordinary skill in the art. Artisans of ordinary skill may not recognize the inherent characteristics or functioning of the prior art." Id.; *Schering Corp. v. Geneva Pharms., 339 F.3d 1373, 1377 (Fed. Cir. 2003)* (rejecting [*22] the contention that inherent anticipation requires recognition in the prior art). Though Drs. Lovgren and Lundberg may not have recognized that a characteristic of CKD's Method A ingredients, disclosed in the CKD Patent Application, resulted in an in situ formation of a separating layer, the in situ formation was inherent.

The record shows formation of the in situ separating layer in the prior art even though that process was not recognized at the time. The new realization alone does not render that necessary prior art patentable. Id. (citing *Atlas Powder, 190 F.3d at 1347*) ("[T]he [HN5] discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's function, does not render the old composition patentably new to the discoverer."); *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc., 246 F.3d 1368, 1376 (Fed. Cir. 2001)* (explaining that newly discovered results of known processes are not patentable because those results are inherent in the known processes); *Verdegaal Bros., Inc. v. Union Oil & Co. of Cal., 814 F.2d 628, 633 (Fed. Cir. 1987)* (holding that the [*23] recognition of a new aspect of a known process is not a patentable invention of a novel process). Despite CKD's denials, Drs. Lovgren and Lundberg realized and explained that CKD's OMP tablet's formation of a separating layer was a natural result flowing from the combination of certain ingredients listed in Method A. That explanation, however, does not make that prior art patentable. The ingredients and protocols CKD gave to the KIPO and Astra in 1993 and 1994 necessarily resulted in in situ formation of a separating layer. Thus, the trial court correctly found inherent anticipation.

IV

Claim 9 of the *'281 patent* is dependent on claim 1. Claim 9 claims the ARC as an alkaline salt of phosphoric acid, carbonic acid, or silicic acid. The district court found that, in light of the CKD Patent Application, it would have been obvious to a person of ordinary skill in the art to substitute the alkaline salts called for by claim 9 of the *'281 patent* for the arginine disclosed in the CKD Application. In other words, the district court concluded that it would have been obvious to substitute one ARC for another. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *45*. [HN6] Obviousness under *35 U.S.C. § 103* [*24] is a legal conclusion based on underlying factual determinations. *Medichem, S.A. v. Rolabo, S.L., 437 F.3d 1157, 1164 (Fed. Cir. 2006)*.

CKD's patent application coats a core containing an amino acid or an alkali salt of omeprazole as the "basic part" or "alkali reaction component." Id. The district court (and the Korean Appellate Court) found that the CKD application lists arginine as the "basic part" of the core and, alternatively, L-arginine as "an alkali substance." *2004 U.S. Dist. LEXIS 9447 at *45*; (Korean) Appellate Trial Court Decision at 3, In Re Omeprazole Patent Litig., Appeal Nos. 04-1562, 04-1563, 04-1589 (Fed. Cir. Aug. 13, 2004). Before the appellate court in Korea, Astra conceded that "L-arginine is generally known as an alkaline reactive compound." Id., Astra's Supplement of the Reasons for the Request for Appeal (to Korean Appellate Court), at 8. Astra also acknowledged that its patented invention could easily "substitute alkaline reactive compounds [for the] L-arginine in Method A." Id. at 7-8.

The record shows that Dr. Banakar testified that it would have been obvious to a person of ordinary skill in the art of pharmaceutical formulation to replace [*25] the arginine in the CKD application with an alkaline salt of phosphoric acid, carbonic acid, or silicic acid. As Dr. Banakar noted, all such substances are ARCs that can stabilize omeprazole. *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *45*. The district court noted that "Dr. Banakar's testimony is corroborated by Astra's own admissions that arginine is 'just like' other ARCs and 'it is easy to substitute' arginine for another ARC." Id.

Astra countered that these statements in the Korean proceedings "addressed whether arginine can function as an ARC stabilizing agent in the context of the Korean *'505* sister patent - not the *'281 patent* at issue." However, Astra still admitted that an ARC could easily replace CKD's L-arginine. Therefore, this court finds no clear error in the district court's factual findings and no error in its conclusion that it would have been obvious to one skilled in the art to substitute one ARC for another. Therefore, claim 9 of the *'281 patent* would have been obvious at the time of invention.

V

Andrx argues the district court erred in declining to find the *'281 patent* unenforceable through inequitable conduct and fraud on the PTO and in denying its claim for attorney [*26] fees under *35 U.S.C. § 285*. Andrx also states in its brief that it "is entitled to a ruling on its counterclaims" and that "the district court must rule on the inequitable conduct and fraud claims for the determination of attorney fees under *35 U.S.C. § 285*." Appellant's Br. at 51. The district court did not entertain Andrx's inequitable conduct and fraud defenses because it considered them "mooted by [its] rulings that each of the asserted claims of the *'281 patent* is invalid." *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *47*. The district court did consider Andrx's "unclean hands" argument, but found no evidence to support a finding of "unclean hands." *Id., 2004 U.S. Dist. LEXIS 9447 at *49*. [HN7] This court reviews an ultimate inequitable conduct determination for abuse of discretion and the underlying determinations including materiality and intent under the clearly erroneous standard. *Molins PLC v. Textron, Inc., 48 F.3d 1172, 1178 (Fed. Cir. 1995)*. [HN8] Andrx bears the burden of proving by clear and convincing evidence that Astra acted with unclean hands. See generally 6 Donald S. Chisum, Chisum on Patents: A Treatise on the Law of Patentability, [*27] Validity, and Infringement § 19.03[5] (2001).

Andrx's "unclean hands," fraud, and inequitable conduct arguments were much more limited before the district court than as presented to this court. Before the district court, Andrx raised an "inventors' oath" argument claiming that the *'281* inventors were not truly the inventors of the process claimed in the *'281 patent*. On inequitable conduct during prosecution of the *'505* and *'230 patents*, the district court stated:

> After a complete review of the hundreds of pages of proposed findings of fact and conclusions of law submitted by Andrx in support of its unclean hands theory, the court is utterly unpersuaded.

*Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *48*. As evidence of unclean hands, Andrx asserted "(1) delay of trial; (2) affirmative use of tainted evidence; and (3) withholding significant documents until after the Phase I and II trials were completed." *2004 U.S. Dist. LEXIS 9447 at *48*. The district court attributed delay equally to Andrx and Astra. Furthermore, the trial court noted that Andrx, not Astra, requested that the *'281 patent* be tried with the *'505* and *'230 patents. 2004 U.S. Dist. LEXIS 9447 at *49*. Now before this court, Andrx [*28] hopes to argue that Astra's inventors misrepresented facts to the PTO and deliberately failed to disclose the Korean Litigation and KIPO proceedings to the PTO. This court need not reach issues Andrx did not raise properly in proposed post-trial findings before the District Court. *Viskase Corp. v. Am. Nat'l Can Co., 261 F.3d 1316, 1326 (Fed. Cir. 2001)*.

The district court stated that it would "not make detailed findings concerning Andrx's additional defenses pertaining to the *'281 patent*, which are mooted by this court's rulings that each of the asserted claims of the *'281 patent* is invalid." *Omeprazole III, 2004 U.S. Dist. LEXIS 9447 at *47*. The inequitable conduct claim was not technically moot, because it would have rendered the entire *'281 patent* unenforceable, rather than just the claims that were held invalid. Nonetheless, the court's ruling on mootness did not prejudice Andrx, because the record contains no support for Andrx's argument that the *'281 patent* inventors' conduct before the PTO constituted inequitable conduct. Instead, the inventors disclosed the Korean litigation and KIPO proceedings. The PTO examiner had the benefit of this information before allowance of the [*29] patent. Furthermore, the record shows that CKD consistently represented to the *'281 patent* inventors that their omeprazole product did not have a separating layer. Thus, those inventors had every reason to believe that they had invented the process disclosed in the *'281 patent*. As a result, nothing in the record would support a finding that the inventors engaged in inequitable conduct. The district court did not err or abuse its discretion in finding that Andrx did not show fraud, "unclean hands," or inequitable conduct. Without a finding of inequitable conduct in the first instance, Andrx cannot possibly prevail with its new contentions of "infectious unenforceability" against all patents in suit, including the *'230* and the *'505* (which were held valid and infringed).

Lastly, in August 2004, after it issued its opinion on the two phases on appeal here, the district court found Astra, not Andrx, the "prevailing party." *In re Omeprazole Patent Litigation, M-21-81 (BSJ), MDL Docket No. 1291, 2004 U.S. Dist. LEXIS 15619 (S.D.N.Y. August 8, 2004)* (Costs Order). In the words of the trial court, "Astra is the prevailing party because its successes on its affirmative claims far outweigh any gains Defendants made [*30] on their counterclaims." *Costs Order, 2004 U.S. Dist. LEXIS 15619 at *3*.

[HN9] This court reviews a denial of attorney fees under *35 U.S.C. § 285* for an abuse of discretion; however, this court reviews the factual determination of whether a case is exceptional under *§ 285* for clear error. *Q-Pharma, Inc. v. Andrew Jergens Co., 360 F.3d 1295, 1299 (Fed. Cir. 2004)* In addition, this court reviews the meaning of the term "prevailing party" without deference. *Inland Steel Co. v. LTV Steel Corp., 364 F.3d 1318, 1320 (Fed. Cir. 2004)* (citing *Waner v. Ford Motor Co., 331 F.3d 851, 857 (Fed. Cir. 2003)* ("We review de novo whether the district court applied the proper legal standard under *35 U.S.C. § 285*, and we review the court's factual findings, including whether the case is exceptional, for clear error.")).

In Phases I and III of this litigation, the district court found most of the asserted claims infringed: (1) Defendant Genpharm, Inc. (Genpharm) literally infringed claims 1, 5, 6, 8, 9, 10, 12, and 14 of the *'505 patent*; (2) Genpharm literally infringed claims 1, 6, 7, 10, 11, 12, and 13 of the *'230 patent*; [*31] (3) three other defendants, referred to collectively as "Cheminor," literally infringed claims 1, 5, 10, and 14 of the *'505 patent*; (4) Cheminor literally infringed claims 1, 6, 12, and 13 of the *'230 patent*; (5) Andrx literally infringed claims 1, 5, 6, 8, and 10 of the *'505 patent*; (6) Andrx literally infringed claims 1, 6, 7, 10, and 13 of the *'230 patent*. *Omeprazole I, 222 F. Supp. 2d at 432-33*.

The district court entered an injunction prohibiting all defendants from marketing their generic omeprazole product through 2007. *Costs Order, 2004 U.S. Dist. LEXIS 15619 at *4*. Also, though the district court also found claim 1 of *United States Patent No. 5,093,342 (the '342 patent)* invalid as anticipated, it found the asserted claims of the *'505* and *'230 patents* not invalid. *222 F.*

Supp. 2d at 433. The district court found that "the *H. pylori* [*'342] patent* . . . of much less significance than the formulation [*'505* and *'230] patents*." *Costs Order, 2004 U.S. Dist. LEXIS 15619 at *6*. Moreover, in Phases II and IV, the district court also found that Andrx literally infringed claims 1, 2, 3, 7, 9, 16, and 20-21 of the *'281 patent*. Final Judgment, slip op. at 1. Therefore, this court [*32] finds no clear error in the district court's conclusion that this case was not exceptional, and finds no error in the district court's conclusion that Astra was the prevailing party. The district court properly applied the proper standards. Because *section 285* allows an award of attorney fees only to the "prevailing party," the district court's conclusion that Andrx cannot recover attorney fees is not an abuse of discretion.

VI

In conclusion, this court affirms the district court's judgment finding that Andrx literally infringed claims 1, 2, 3, 7, 9, 16, and 20-21 of Astra's *'281 patent*, but that claims 1, 2, 3, 7, 16, and 20-21 of the *'281 patent* are anticipated and that claim 9 of the *'281 patent* is obvious. This court also affirms the district court's conclusion that Andrx's counterclaims were mooted, that there was no inequitable conduct, fraud, or unclean hands in Astra's prosecution of the *'281 patent*, and that Astra's *'505* and *'230 patents* are not unenforceable through "infectious unenforceability."

COSTS

Each party shall bear its own costs.

AFFIRMED

CONCUR BY: NEWMAN (In Part)

DISSENT BY: NEWMAN (In Part)

DISSENT: NEWMAN, Circuit Judge, concurring in part, dissenting in [*33] part.

I concur in the court's ruling that the claims are infringed if valid, as well as the rulings on the issues of inequitable conduct, fraud, unclean hands, and attorney fees. However, I cannot agree that the claims of the *'281 patent* are invalid, for the findings of "inherent anticipation" and obviousness are based on incorrect premises of law.

Applying a novel theory of "inherent anticipation," the court invalidates Astra's patent on a newly discovered chemical process: a process involving known ingredients but different and previously unknown reaction conditions and achieving a different result. Based on a flawed analysis of the law of "inherent anticipation," the court invalidates the patent on Astra's previously unknown process for producing an in situ polymeric sublayer for omeprazole. The court apparently reasons that because the ingredients were known, it is irrelevant that a significant change in conditions produces a result that is different from that achieved under the conditions of the prior art. Such a view of "inherency" is contrary to legal as well as scientific principles.

The court's explanation and citation of authority suggest that my colleagues have confused [*34] the law governing patentability of a newly discovered use of a known composition, which is achieved by "process" claim, n1 with the unpatentability of the known composition itself. The claims at issue are not directed to a composition; they are directed to a process for forming a sublayer from known ingredients:

> Claim 1. A process for preparing an oral pharmaceutical formulation comprising the steps of:
>
> forming a core material comprising a proton pump inhibitor and at least one alkaline reacting compound, wherein the concentration of the alkaline reacting compound is about 0.1 mmol/g dry ingredients in the alkaline containing part of the core material, and
>
> applying an enteric coating polymer layer so as to surround the core material thereby forming in situ a separating layer as a water soluble salt product between the alkaline compound and the enteric coating polymer.

The Astra process is not described in the prior art, although Astra admitted that it believed that the Korean company Chong Kun Dan Corporation (CKD) had made such a product. It is not disputed that such a sublayer does not form under the conditions in the CKD patent application. No such reaction is described [*35] in CKD's Korean patent application, nor the conditions that could have produced such a product. Nonetheless, my colleagues rule that the process discovered by Astra is "inherently anticipated" by the CKD application. That is not the law of either anticipation or inherency. I must, respectfully, dissent.

> n1 *35 U.S.C. § 100(b)* defines "process" as follows: "The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."

"Anticipation" Means Lack of Novelty

Novelty is fundamental to patentability. Lack of novelty, or "anticipation" in patent-ese, means that the subject matter was previously known in terms of *35 U.S.C. § 102*. n2 While some properties and uses of known compositions may indeed be "inherently anticipated" in that their existence would have been known to persons in the field of the invention, even if unpublished, that is not this situation. No prior art describes the Astra process, and there is no evidence that a person of ordinary skill would have known of its existence. What is unknown cannot "anticipate."

> n2 *35 U.S.C. § 102* provides that novelty is negated if the invention was known or used by others in the United States, *§ 102(a)*; or if the invention was patented or described in a printed publication, *§ 102(b)*; or in public use or on sale, *§ 102(b)*; or derived from another, *§ 102(f)*; or the prior invention of another who did not abandon, suppress, or conceal it, *§ 102(g)*.

[*36]

Anticipation requires that "each element of the claim at issue is found, either expressly described or under the principles of inherency, in a single prior art reference or that the claimed invention was previously known or embodied in a single prior art device or practice." *Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771 (Fed. Cir. 1983)*. See *MEHL/Biophile Int'l Corp. v Milgraum, 192 F.3d 1362, 1365 (Fed. Cir. 1999)* (to anticipate, a single reference must teach every limitation of the claimed invention; any limitation not explicitly taught must be inherently taught and would be so understood by a person experienced in the field); *In re Baxter Travenol Labs., 952 F.2d 388, 390 (Fed. Cir. 1991)* (the dispositive question is "whether one skilled in the art would reasonably understand or infer" that a reference teaches or discloses all of the elements of the claimed invention); *Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1268-69 (Fed. Cir. 1991)* (to anticipate, every element of the claims must appear in a single prior art reference, or if not expressly shown, then demonstrated to be known to persons experienced [*37] in the field of technology); *In re Samour, 571 F.2d 559, 562 (CCPA 1978)* (the key question is whether a single prior art reference "publicly discloses every material element of the claimed subject matter").

The principle of "inherency," in the law of anticipation, requires that any information missing from the reference would nonetheless be known to be present in the subject matter of the reference, when viewed by persons experienced in the field of the invention. However, "anticipation by inherent disclosure is appropriate only when the reference discloses prior art that must necessarily include the unstated limitation, [or the reference] cannot inherently anticipate the claims." *Transclean Corp. v. Bridgewood Servs., Inc., 290 F.3d 1364, 1373 (Fed. Cir. 2002)* (emphasis in original); *Hitzeman v. Rutter, 243 F.3d 1345, 1355 (Fed. Cir. 2001)* ("consistent with the law of anticipation, an inherent property must necessarily be present in the invention described by the count, and it must be so recognized by persons of ordinary skill in the art"); *In re Robertson, 169 F.3d 743, 745 (Fed. Cir. 1999)* (that a feature [*38] in the prior art reference "could" operate as claimed does not establish inherency).

Thus when a claim limitation is not explicitly set forth in a reference, evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co., 948 F.2d at 1268*. It is not sufficient if a material element or limitation is "merely probably or possibly present" in the prior art. *Trintec Indus., Inc. v. Top-U.S.A. Corp., 295 F.3d 1292, 1295 (Fed. Cir. 2002)*. See *W.L. Gore v. Garlock, Inc., 721 F.2d at 1554 (Fed. Cir. 1983)* (anticipation "cannot be predicated on mere conjecture respecting the characteristics of products that might result from the practice of processes disclosed in references"); *In re Oelrich, 666 F.2d 578, 581 (CCPA 1982)* (to anticipate, the asserted inherent function must be present in the prior art).

Applying these principles, it is incorrect to hold that the CKD application "inherently anticipates" the *'281* invention. The panel majority contravenes this vast body of precedent, [*39] for it is not disputed that no reference explicitly or inherently teaches the process that Astra found to produce an in situ polymeric sublayer. The requirements of inherent anticipation were not met.

Anticipation Also Requires Enablement

To "anticipate," the identical subject matter must not only be previously known, but the knowledge must be sufficiently enabling to place the information in the possession of the public. In *Seymour v. Osborne, 78 U.S. 516, 20 L. Ed. 33 (1870)*, the Supreme Court explained:

> Patented inventions cannot be superceded by the mere introduction of a [prior art reference] unless the description and drawings contain and exhibit a substantial representation of the patented improvement, in such full, clear, and exact terms as to enable any person skilled in the art of science to which it appertains, to make,

> construct, and practice the invention to the same practical extent as they would be enabled to do if the information was derived from a prior patent. Mere vague and general representations will not support such a defense, as the knowledge supposed to be derived from the publication must be sufficient to enable [*40] those skilled in the art or science to understand the nature and operation of the invention, and carry it into practice use. Whatever may be the particular circumstances under which the publication takes place, the account published, to be of any effect to support such a defense, must be an account of complete and operative invention capable of being put into practical operation.

78 U.S. at 555 (emphases added). Precedent illustrates this principle in many areas of technology. See, e.g., *Elan Pharmaceuticals, Inc. v. Mayo Foundation, 346 F.3d 1051, 1054-55 (Fed. Cir. 2003)* (anticipation requires enablement, whereby the reference "must teach one of ordinary skill in the art to make or carry out the claimed invention without undue experimentation"); *Helifix Ltd. v. Blok-Lok, Ltd., 208 F.3d 1339 (Fed. Cir. 2000)* (a prior art reference that does not enable a person of ordinary skill in the art to practice the claimed invention does not anticipate the patent claims); *Akzo N.V. v. United States Int'l Trade Comm'n, 808 F.2d 1471, 1480 (Fed. Cir. 1986)* (anticipation requires that the reference publicly discloses [*41] all elements of the claimed invention and enables its practice); *Paperless Accounting, Inc. v. Bay Area Rapid Transit Sys., 804 F.2d 659, 665 (Fed. Cir. 1986)* (a non-enabling publication is insufficient to anticipate under *§ 102(b)*, although it may raise *§ 103* issues).

All parties agree that the closest prior art is the Korean CKD application. It was not disputed that the ingredients of the Astra and the CKD omeprazole formulations are the same standard enteric ingredients. Several references describe the use of microcrystalline cellulose plus an alkaline-reacting compound to formulate pharmaceuticals for drug delivery. However, no reference describes the conditions by which Astra produced an in situ interior sublayer. No reference suggests formulation temperatures at or below 42 s[degrees]s C, or that such a sublayer might form at such low temperatures.

Andrx's expert witness Dr. Banakar agreed that it was not possible to know, from the CKD Korean application, how or if the reaction conditions could be changed so as to produce an in situ sublayer. Although the panel majority states that Dr. Banakar testified that "if a formulator followed the CKD process [*42] as described in the CKD Patent Application, the separating layer would form in situ 'each and every time,'" on cross-examination Dr. Banaker admitted that he had conducted no experiments and his conclusion was without verification. He stated that his sole basis for "each and every time" was the Astra argument in the Korean proceedings, the argument that was negated by the evidence in the Korean court, including the testimony of Professor Chung, the Korean court-appointed expert. In all of the proceedings, in Korea and in the United States, it was never disputed that the CKD application does not disclose a separating sublayer, and that such a sublayer does not form in the conditions described for the CKD process. CKD testified in the Korean court that it consistently operated at or near the 70 s[degrees]s C set forth in the CKD Korean application, and that no in situ sublayer was produced.

In the present litigation, the Andrx expert Dr. Banakar testified that specific process conditions are necessary to form an in situ separating layer, that such conditions are different from those set forth in the Korean application, and that his only basis for proposing that the Koreans [*43] formed an in situ sublayer was because Astra had unsuccessfully so argued in Korea. Astra states that its argument was based not on information contained in the Korean patent application or gleaned in the Korean litigation, but on testing of a CKD product. It is not now disputed that the Korean process does not produce a separating sublayer.

By no stretch of fact or law can the Korean application inherently anticipate what it could not produce. A non-enabling reference cannot serve as an invalidating anticipation, either expressly or inherently. My colleagues on this panel, holding otherwise, do not explain how they plug this scientific and legal gap. Such an unexplained finding of inherent anticipation does not add clarity to this jurisprudence.

Secret Information Cannot "Anticipate"

My colleagues speculate that CKD practiced a sublayer-producing process in secrecy, although the Korean inventors denied such practice in the proceedings in the Korean Patent Office and also in the Seoul District Court. Whatever may or may not have been done in secret in Korea does not convert a secret and still unknown process into prior art. "Anticipating" subject matter must be [*44] known, and the knowledge must be sufficient to place enabling information in the possession of the public. See, e.g., *Vulcan Eng'g Co. v. FATA Aluminium, Inc., 278 F.3d 1366, 1372-73 (Fed. Cir. 2002)* (a secret system that was not known or publicly used in the United States is not prior art and cannot "anticipate"); *Woodland*

Trust v. Flowertree Nursery, Inc., 148 F.3d 1368, 1371 (Fed. Cir. 1998) (secret prior use or knowledge by another is not a bar to patentability).

The Korean court found that an in situ sublayer was not produced by the process set forth in the CKD specification. I repeat, this finding is not challenged by any evidence presented in this case. Even if CKD indeed practiced a secret process in Korea, and made a sublayer while concealing the process, such an unknown process is not an inherent anticipation.

Patentability of the '281 Process

Astra informed the United States patent examiner that the Korean proceedings included CKD's challenge to the validity of the Korean counterpart of Astra's *'281 patent*. Astra submitted to the PTO, with English translations, CKD's Korean patent application, Astra's Opposition [*45] Statement, the Korean Patent Office's Confirmation of Scope decision of September 25, 1994, Astra's evidence that the CKD product has a separating sublayer, and the Korean district court's ruling that the CKD process does not produce an in situ separating sublayer.

On this background, the United States examiner found that the *'281* process was patentable. My colleagues on this panel rely on cases which hold that a known composition cannot be re-patented as a composition when a new property is discovered, citing *Atlas Powder, 190 F.3d at 1347*, and *Bristol-Myers Squibb, 246 F.3d at 1376*. That is a correct statement of law, but irrelevant to this case. The '281 claims are not for a known composition; the claims are for a newly discovered process. See *Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 875 (Fed. Cir. 1985)* (a new process is patentable subject matter, whether or not the product is already known); *Atlantic Thermoplastics Co., Inc. v. Faytex Corp., 970 F.2d 834, 841 (Fed. Cir. 1992)* ("In the words of the Supreme Court, 'While a new process for producing [a known composition] was patentable, the product itself [*46] could not be patented . . . .'" (quoting *Cochrane v. Badische Anilin & Soda Fabrik, 111 U.S. 293, 312, 4 S. Ct. 455, 28 L. Ed. 433, 1884 Dec. Comm'r Pat. 230 (1884))*; *Ansonia Brass & Copper Co. v. Electrical Supply Co., 144 U.S. 11, 12 S. Ct. 601, 36 L. Ed. 327, 1892 Dec. Comm'r Pat. 313 (1892)*. No reference shows the process conditions by which Astra produced the sublayer.

Obviousness of Claim 9

The invalidation of claim 9 is a misapplication of the law of obviousness, for there was no prior art or even general knowledge that suggested that a major lowering of the formulating temperature would cause a polymeric sublayer to form in situ. The court's invalidation of claim 9 appears to be founded on the postulate that CKD had a secret process for making the disavowed sublayer. Accepting that Astra's scientists, Dr. Lovgren and Dr. Lundberg, believed that CKD had made an in situ sublayer and thereby were spurred to experimental investigation, that did not render their success obvious. Obviousness cannot be based on secret or concealed information.

In addition, no references have been cited to suggest that the phosphoric acid, carbonic acid, or silicic acid of Astra's claim 9 should replace the zwitterionic [*47] L-arginine in the Korean formulation. And no reference suggested that such a change, combined with a significant temperature reduction, would produce an in situ separating sublayer. Hindsight is not an available analytical mechanism to show obviousness. See *Interconnect Planning Co. v. Feil, 774 F.2d 1132, 1138 (Fed. Cir. 1985)* ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.")

Conclusion

It is apparent that the requirements of "inherent anticipation" are not met. A consistent law, and consistent application, are critical to technological innovation. n3 The panel majority's divergence from precedent not only has led the court to invalidate a fully valid patent, but also brings further uncertainty to this important aspect of patent law.

n3 In summarizing cases showing that Federal Circuit decisions have "oscillated" with respect to inherent anticipation, 1 Chisum on Patents, § 3.03[2][c], p. 3-83 (2006) states "some [Federal Circuit panels] stating that recognition is required, others stating that recognition is not required."

[*48]

EXHIBIT G

THIS EXHIBIT HAS BEEN
REDACTED IN ITS ENTIRETY

EXHIBIT H

FRONT NINE
1. Tours
2. Instruction
3. Equipment
4. Travel
5. Real Estate
6. Stats
7. Features
8. Rules
9. Fitness
Find Courses on GOLFCOURSE.com
GO
BACK NINE
10. Subscribe
11. Newsletter
12. Pro Shop
13. Fantasy Golf
14. Golf Packages
15. Get a Handicap
16. Travel Offers
17. Media Kit
18. About Us
Search Site
GO
Advanced Search
Weather
GO
Enter city or U.S. Zip

2004 Ball Guide

Sphere Factors

By The Editors
GOLF MAGAZINE

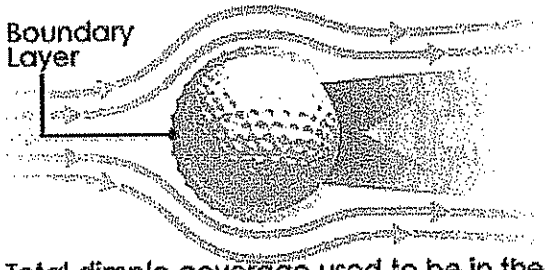
E-mail Print
Most Popular

July 2004

Which Ball Should You Play?
Easy—the one that's right for you. And that's where it gets hard. Or soft. Or cheap or expensive. It all depends. Read on to see how dimples work, how backspin was born, why balls come in two- , three- and four-piece models, how today's balls are made, how they stack up, and a whole lot more.

Related Links
- Introduction
- Sphere factors
- The Price of Flight
- Timeline
- Birth of a ball
- Future ball
- Listings

Dimples Made Simple
A smooth ball pushes through the air like a paddle through water; adding dimples to it creates a boundary layer, a turbulent stream of air that sticks to the ball. When backspin is produced, the boundary layer is thinner—less turbulent—on top of the ball and thicker below. Air that would otherwise slow the ball's flight flows over the top and disperses behind and below the ball. This keeps air pressure higher beneath the ball's equator, adding lift, and allows smooth-flowing air to travel farther around the back of the ball, reducing drag. "Drag is like the wake behind a boat," says Tom Kennedy, Top-Flite's senior vice president of research development. "The larger the wake, the more drag on the boat. Dimples



- Total dimple coverage used to be in the 65 percent range.
- Most modern dimples cover at least 80 percent, for a more stable flight.
- The average depth of a dimple? A mere hundredth of an inch.

minimize the wake behind a ball."

A ball designer's main task is to optimize the combination of dimples and spin, which contribute equally to lift. Too much lift makes a ball balloon, costing you distance—that's why balls designed with high launch characteristics have shallower, smaller dimples that add little lift. The opposite is true for low-trajectory balls: Bigger, deeper dimples provide extra lift. "The goal of each ball design," says Dean Snell,.product development director at Maxfli, "is to maximize both carry and roll."

Why the Pro V1 is King

The launch of Titleist's Pro V1 was a perfect storm of technology, timing and publicity. In its debut at the 2000 Invensys Classic at Las Vegas, 47 PGA Tour pros—nearly a third of the field—played the new-tech, solid-core three-piece ball. "Part of its success was the new technology, part was the Tour touting it, and part was all the articles in the press," says Edwin Watts, co-owner of Edwin Watts Golf Shops. "Of course, it helped that this was a very good product."

"Titleist practically owns the Tour when it comes to balls," adds George Whalin, president and CEO of Retail Management Consultants, "and nothing creates buzz like the Tour. Customers didn't care about the technology. All they knew was the Tour used it and the ball worked."

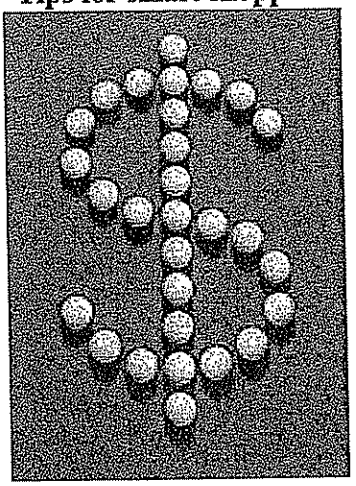
"I've seen other balls create that kind of buzz," says Watts. "But none has sustained so much interest. One reason is that Titleist has upgraded the ball each year." By December 2001, 14.1 percent of the balls sold in pro shops and golf specialty stores were Pro V1s. Through March 2004, that number (including sales of the four-piece Pro V1x, geared for higher swing speeds) had risen to 18.4.

Long and Wrong

Last year, Americans bought more than a

ADD TO YOUR CART?

Tips for smart shoppers



VALUE PLAY

Think playability, not price, says George Sine, Titleist's vice president of golf ball marketing. "The most costly mistake golfers make in ball selection is relying solely on price, as opposed to the more valuable cost-versus-performance equation," Sine says.

SEARCH ENGINES

The .questionnaire at Imprint Golf (imprintgolf.com/golfballselection.page.htm) can help you find the ball for your game. If you're loyal to one brand, go to its Web site—many can help fit you online.

DO LAUNCH

Launch monitors can do more than help in clubfitting, says John Clouse, merchandise manager for the national retail chain Golf Galaxy. "They measure spin rate and speed, so we can use

million nonconforming golf balls from a handful of small companies. The balls' wild names and claims are hard to ignore. The Condor S "flies like a U-2" and sticks "like a dropped cat"; the Desperado's "blazing hot core" gives you 25 extra yards. "Sure, they're illegal," says Troy Puckett Jr., president of Cayman Golf, which makes the Desperado. "So is speeding, but everybody does it."

The science is simple. Hot balls are smaller than the legal kind (typically 1.65 inches in diameter vs. the USGA's 1.68 minimum) and heavier (about 49 grams to 45.93). All else being equal, that means less drag in the air and more roll on the ground. Puckett, whose balls are sold in Restoration Hardware stores nationally, says an average player could add 30 yards to his drives with a ball like the Desperado, and see his short irons fly higher and land softer. (The harder and heavier the ball, the faster it rolls up the clubface, boosting launch angle.)

But wait, there's more! Hot balls are cheap—most go for about $20 a dozen. And they might even help you with the flatstick. "The smaller the ball is," says Puckett, "the easier it is to fit in the hole, right?"

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them to fit a ball to a player."

KNOW YOUR GAME

All you care about is bombing it past your pals? "If you're after distance," says Srixon's Mike Pai, "there are plenty of inexpensive balls designed for one thing: Hitting it really far."

CLOSE RANGE

When judging new balls on the course, your hot zone is inside 150 yards, says Maxfli's product development director, Dean Snell. That's where models differentiate themselves—all modern balls bark, but not all bite.

POSITION PLAY

Balls are a low-margin item, so store owners like to parade you past the rest of their goodies before you get to them. Once there, you may find high-end balls prominently positioned and bargain models practically hidden.

EXHIBIT I

THIS EXHIBIT HAS BEEN REDACTED IN ITS ENTIRETY